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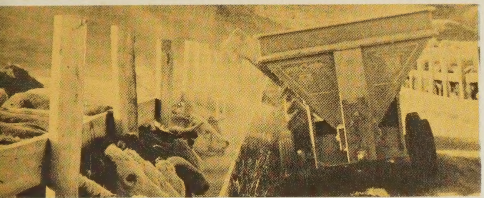

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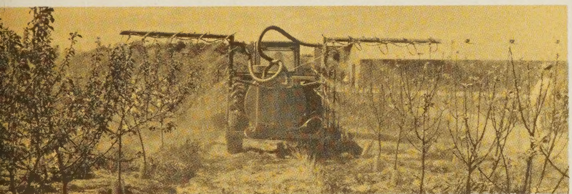

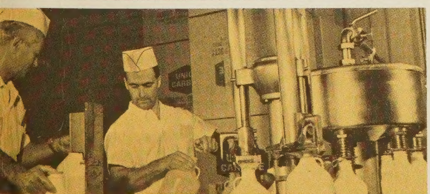

CANADIAN
AGRICULTURAL OUTLOOK CONFERENCE
OTTAWA 1974

Canadian Farm Economics is published bi-monthly by the Economics Branch, Canada Department of Agriculture, Sir John Carling Building, Ottawa, and is based on material prepared by economists of the Economics Branch.

Purpose: To provide current information on agricultural economics for economists, representatives of extension, education, press, agri-business, trade, foreign offices, bio-physical and social science researchers, administrators, librarians and leading farmers.

Subscription: This publication does not require a subscription. To receive this publication regularly, write a letter requesting to be placed on the mailing list, for CFE to the Managing Editor, Room 339, Economics Branch, Canada Department of Agriculture, Sir John Carling Bldg., Ottawa, K1A 0C5.

Letters from readers: Letters are encouraged and should be addressed to the author or the Managing Editor. Responses . . . comments, suggestions and points of view are important for effective two-way communications. Letters may be used in the following issue of CFE and will be edited prior to publication where necessary.

FOREWORD

The 1974 Canadian Agricultural Outlook Conference, which is part of a continuing program to provide commodity outlook information for farmers and for other groups in the Canadian agriculture and food industry, was held in Ottawa, at the Government Conference Centre, on January 28th and 29th. The official delegates to the Conference from provincial departments of agriculture, farm organizations, colleges of agriculture, agribusiness, and the federal government, were mailed copies of the "Situation Outlook" publication, before the Conference, for study purposes. At the Conference papers were presented on the Outlook for each commodity. This was followed by papers on implications, alternatives and discussions.

This publication contains the papers presented at the Conference on each commodity and on the world food situation, short-term prospects for the Canadian economy, energy and agriculture and farm income.

This document should be used in conjunction with information to be published by Agriculture Canada in the weeks and months ahead. More local information from provincial departments of agriculture, farm organizations, agribusiness groups and Colleges of Agriculture should be used to supplement the contents.

The Department sincerely appreciates the co-operation and the contributions of all those people who prepared and gave papers, who contributed to the discussions and who helped extend this information to other people.

It is hoped that this document will provide people in farming, press, extension, farm organizations, agribusiness, governments, consumer groups and other organizations with useful data and information for making decisions.

The Proceedings of this Outlook Conference are being published as a special issue of the periodical called Canadian Farm Economics in order to maximize the efficiency of editing, typing, translating and printing of these publications and in order that this information will reach readers as quickly as possible.

John J. McConnell
Chief of Legislation & Publications
Economics Branch
Agriculture Canada
February 5, 1974

FOREWORD

The 1974 Canadian Agricultural Outlook Conference, which is part of a continuing program to provide commodity outlook information for farmers and for other groups in the Canadian Agriculture and Food Industry, was held in Ottawa, at the Government Conference Centre, on January 14th and 15th. The official delegates to the Conference from provincial departments of agriculture, farm organizations, colleges of agriculture, agribusiness, and the federal government, were mailed copies of the "Situation and Outlook" publication, before the Conference, for study purposes. At the Conference papers were presented on the outlook for each commodity. This was followed by papers on implications, alternatives and discussions.

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January 28, 29, 1974

Government Conference Centre
Ottawa

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9:10 a.m.	GENERAL ECONOMIC SITUATION AND OUTLOOK Session Chairman - R.P. Poirier Assistant Deputy Minister, Economics Agriculture Canada The Canadian Economy and Its Short-Term Prospects - André Raynauld Chairman Economic Council of Canada	
9:50 a.m.	World Food Shortage - A.G. Leeks Economic and Social Policy Department Food & Agriculture Organization of the United Nations Rome, Italy	
10:20 a.m.	BREAK	MAIN LOUNGE
10:40 a.m.	Canadian Production Potentials - J.C. Woodward Assistant Deputy Minister, Research Agriculture Canada	CONFERENCE HALL
11:10 a.m.	Energy and Agriculture - C.G.E. Downing, Director Engineering Research Service Agriculture Canada	
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Session Chairman
- W.E. Jarvis
  Assistant Deputy Minister
  Production & Marketing and Health of Animals
  Agriculture Canada

WHEAT

Outlook
- S.W. Garland, Economist
  Economics Branch
  Agriculture Canada

Implications and Alternatives
- W.M. Miner
  General Director
  Grain Marketing Office
  Industry, Trade & Commerce

FEED GRAINS

Outlook
- J.S. Carmichael, Economist
  Economics Branch
  Agriculture Canada

Implications and Alternatives
- H.D. Pound
  Chief Commissioner
  Canadian Grain Commission
  Winnipeg, Manitoba

OILSEEDS
- B.W. Paddock, Economist
  Economics Branch
  Agriculture Canada

Implications and Alternatives
- W.J. Craddock
  Department of Agricultural Economics
  and Farm Management
  The University of Manitoba
  Winnipeg, Manitoba

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3:30 p.m. Panel Discussion - Grains and Oilseeds — CONFERENCE H

Leader
- A.E. Hannah, Assistant Deputy Minister
  Food Systems
  Agriculture Canada

RECESS

nuary 29
esday

:30 a.m. COMMODITY OUTLOOK — CONFERENCE HALL

Session Chairman
- G.R. Purnell
  Deputy Minister
  Alberta Department of Agriculture
  Edmonton, Alberta

BEEF CATTLE & HOGS

Outlook
- F.E. Payne, Director
  Livestock Division
  Agriculture Canada
- A.M. Boswell, Economist
  Economics Branch
  Agriculture Canada

PANEL DISCUSSION
- C.A. Gracey, Canadian
  Cattlemen's Association
  Toronto, Ontario
- S.S. Berg
  High/Bred Stock Farm
  Ardrossan, Alberta
- T.C. Kerr, Economist
  Economics Branch
  Agriculture Canada

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- Nelson Longmuir, Economist
  Economics Branch
  Agriculture Canada

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- Benoit Lavigne, Chairman
  Quebec Agricultural Marketing Board
  Montreal, Quebec

DISCUSSION

:00 a.m. DAIRY

Outlook
- V. McCormick, Economist
  Economics Branch
  Agriculture Canada

Implications and Alternatives
- Ellard Powers, Chairman
  Canadian Dairy Commission
  Beachburg, Ontario

DISCUSSION

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Session Chairman
- Gaetan Lussier, Deputy Minister
  Quebec Department of Agriculture
  Quebec, Quebec

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- K.M. Hunter,
  Fruit & Vegetable Division
  Agriculture Canada

- T.A. Bennett, Economist
  Economics Branch
  Agriculture Canada

Outlook - Ornamentals
- A.P. Chan, Director
  Ornamentals Research Service
  Agriculture Canada

Implications and Alternatives
- C. Bernhardt, President
  B.C. Fruit Growers' Association
  Summerland, British Columbia

DISCUSSION

SPECIAL CROPS

Outlook
- C.H. Jefferson, Director
  Plant Products Division
  Agriculture Canada

- A. deLeeuw and N. Longmuir, Economists
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  Agriculture Canada

DISCUSSION

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3:15 p.m. OUTLOOK FOR CANADIAN FARM INCOME LEVELS — CONFERENCE H
- W.L. Porteous, Director
  Agriculture Division
  Statistics Canada

Implications and Alternatives
- P.J. Thair, Head
  Dept. of Agricultural Economics
  University of Saskatchewan
  Saskatoon, Saskatchewan

4:00 p.m. CLOSING REMARKS
- The Honourable Eugene F. Whelan
  Minister of Agriculture

OPENING REMARKS

Hon. Eugene Whelan
Minister
Agriculture Canada

I am pleased to welcome you to the Annual Outlook Conference. The dates of the conference have been changed because this is probably one of the most hazardous years on record when it comes to predicting the future. By changing the dates, our economists have been given more time, and important additional data, so they can develop more accurate opinions and more useful analysis of the outlook situation for this coming year. They now have the added benefit of the material prepared for the United States Outlook, which used to take place after ours, but this year was held earlier than normal, as well as the benefit of annual material just published for the Common Market countries.

Looking back on 1973, it gives me a great deal of pleasure and satisfaction to note that net income for Canadian farmers finally took a major move in the right direction. Net income for 1972 was about $1.8 billion and it looks like it has improved to about $3.4 billion for 1973. We should not lose sight of the fact, however, that operating expenses took a sizeable jump last year. We know from experience that increases in farm prices ARE NOT permanent, but that increased costs of production usually ARE permanent.

I think it is equally important that the Canadian public realize that the improvements in farm income have not been equal, across-the-board improvements for all farmers, nor for all commodity groups. There are producers of some commodities who require improved net incomes if we hope to increase production to meet future demand. In general, these commodities tend to be the ones that use feed grains as an input -- beef, pork and dairy producers. Our agriculture industry continues to have too many farmers receiving too low a level of income. There are a few farmers who are making a satisfactory level of income, but there are many more whose income is below an acceptable income level by anyone's yardstick.

Looking to the future, it is clear that Canadian agriculture is in a relatively strong position. World demand for food is increasing, and especially for the items we are skilled in producing. The supply of water, energy, fertilizer, steel, lumber and many other essential agricultural inputs is running short in many countries. Canada is in a relatively strong position for all of these inputs. The shortages we are experiencing are temporary. In most other nations of the world, the shortages are absolute and permanent; for example, India won't have enough fertilizer and Japan will never have enough land.

There can be absolutely no doubt in today's world that we need all of the expert farmers we can get, and there is also no doubt whatsoever that, as a group, Canadian farmers are among the very best in the world, and that includes thousands of our so-called small farmers.

Economists across North America are grappling with a new set of circumstances today. In the past, they have dealt with an economy that could always increase production. Economic slowdowns were brought about by a slackening in demand. Today, the economists know that there will be an economic slowdown. But this time it will be brought about by a tightening in the supply of raw materials and a dislocation, at least in the supply, of energy, of lumber and newsprint, of steel, fertilizers, and of transportation in different places at different times. These shortages are going to influence agricultural production, marketing and prices. We are already seeing the effects of a shortage of transportation, of feed grains, of lumber, steel and farm equipment. Just last week, I met again with basic product and fertilizer producers to push them into a greater level of cooperation and production and distribution.

In the past, Canadian agriculture has responded immediately and forcefully to increased demand, as reflected in higher commodity prices and profit margins. Today, the response is clouded by the shortages I have mentioned. In addition, the responses are clouded by the fact that the increase in demand is for all food, for all farm products, and not simply for one or several commodities. We can't fill this demand simply by switching from one commodity to another -- for example, from wheat to barley, or from dairy cattle to beef. Today's increased demand must be filled by a general, overall increase in farm production.

Looking back on 1973, we can clearly see that Canadian farmers responded to the increased demand by planting a record acreage. I believe that trend will continue. But I also believe that it will take Canadian farmers, and farmers right around the world, longer to increase production of any single commodity than it has in the past. That is partly because of the tight supply of inputs such as fertilizer and machinery. There is some hope, however, in making agricultural use of slack in some parts of the farm economy at the better price level in existence today.

If the incentive is there, farmers will pick up the slack this year, and then some. Last year, I urged Canadian farmers to produce to beat the band, even while the leaders in some other countries were still hesitating to pull out all the stops. Canadian farmers did respond, and they planted more acres than ever before, used more fertilizer, bought more machinery -- in other words, they produced to beat the band.

I mentioned that agricultural all over the world is bumping up against shortages of inputs, such as energy, land, and water. We are part of the world and are facing some of these shortages ourselves. But, let me stress again that these things are relative. Compared to other nations, Canadian farmers are in a very strong position. Canada is very lucky, because we do not face the same degree of shortages of fertilizer, energy, land and water that other nations face. The shortages we do face, although important to

the producers concerned, are temporary. The three basics for modern agricultural production are energy, land and water. We are blessed with good sources of energy and water, and the only strike against our land is climate. Most other nations face permanent shortages of all three vital inputs, and their marginal land is far more difficult to bring into production than ours.

It is clear that Canada, and all of the nations of the world must give high priority to increasing the general level of food production. Right now, that means increasing the production of farm inputs, including capital, machinery and fertilizer. I believe it must also involve new assurances to farmers that their investments of today will be solid, long-term investments. There are no two ways about it. If food must be guaranteed to consumers, a commitment has to be made by the consumers to producers. In other words, today's increased investment in higher production must not result in surplus prices and bankruptcy in the future. That is why I, and my provincial counterparts, are focussing our attention today on the development of better price and income stabilization programs for farmers. We will also be holding discussions with the major farm organizations in an effort to develop comprehensive and workable price and income stabilization programs and policies that fit this year and that will help take care of the future.

I understand the difficulties of making predictions this year because of the many uncertainties. Because of the experiences of 1973, we're more conscious of the variables and all of the things that can change in the market, and so we are all a little more cautious and a little less willing to stick our necks out. But this is an Outlook Conference. You have the basic data before you. I think we should assume that everyone here has studied the figures. In any case, they are all available to the farmers and the agriculture industry, so I see little point in repeating them at length. Instead, I hope you will get down to the business of outlook.

I want you to state your opinions clearly and sharply. Tell the farmers what you, personally, think the outlook is. Farmers know that your predictions cannot be taken as gospel, and they know they must handle the information from this conference with care. But they need your honest, frank opinions on outlook. Give farmers the opportunity to become acquainted with your views from the various parts of the country, from the federal government, and the farm organizations, so they can judge the value of information from this Outlook Conference.

I think we should all recognize that an Outlook Conference is a place where experienced people put forth their frank and honest opinions about the future. It is not a debating forum or a place to put down the ideas of others, but a conference where we can state our views. In the final analysis, it is not us who will decide the value of our predictions, but the farmers of Canada.

Outlooks are always difficult and predictions are always subject to criticism, especially a year from now when we have the advantage of hindsight. But outlooks can also be exciting and certainly valuable to farmers and our agriculture industry. You have the opportunity to make this the most exciting outlook conference in history. I wish you success.

Thank you.

THE CANADIAN ECONOMY AND ITS SHORT — TERM PROSPECTS

André Raynauld
Chairman
Economic Council of Canada

I am very pleased to have been invited to participate in the 34th Annual Conference on agricultural prospects. I will not be dealing only with problems specific to the agricultural sector, since a number of distinguished speakers far more expert than I in this field will be discussing the basic technical aspects.

I wish to congratulate the sponsors of this Conference for having taken the intiative to provide a forum for a discussion of the worldwide agricultural situation. As you are no doubt aware, the public today is particularly concerned with two acute problems -- the energy crises and the rapid escalation of food prices. These problems are far from being confined to our borders, but we must nevertheless search for relevant solutions to the specific needs of Canadians.

I will attempt to provide a background for your specific discussions and will begin by reviewing the general economic setting that prevailed in 1973 and assessing the trends emerging in the current year. I will then move on to outline the medium-term economic prospects, that is over the period to 1976, with the aid of the performance indicators developed by the Economic Council in its last two Annual Reviews. Finally, I will try to specify the position of the agricultural sector in the Canadian economy as a whole.

The economy is now entering its fourth year of expansion. Capital investment will play the leading role, over consumer expenditures and residential construction, in sustaining the growth of the economy. The emergence of the energy crisis, however, with its broad scope and obvious impact on the economy, compels us to revise our earlier more optimistic projections. Thus, the pace of the expansion in 1974 will, we believe, slow down to about 5 percent, in real terms. An easing of consumer spending and a reduction of expenditures in the housing sector are the key domestic sources of this slowdown, while on the international side we can point to the effect of an expected decline in the growth rate of most industrial countries -- mainly as a result of the energy crisis -- on Canadian exports. This is in sharp contrast to the performance of the Canadian economy in 1973, when the rate of expansion rose to 6.7 percent, in real terms, for the first three-quarters narrowing the gap between actual and potential output to only 2.7 percent.

Personal expenditures for goods and services contributed strongly to the buoyancy of the economy in 1973 by recording an increase of 8.8 percent over the first three-quarters. In 1974, we expect a return to a more stable growth at a rate of 5.4 percent, in comparison to 8.5 percent for the complete year 1973. This reduction in the rate of expansion of consumer spending will derive principally from declines in purchases of durables such as cars, furniture, and electrical appliances. The current trend suggests that consumers will spend more for semidurables and services this year than they did last. Incidentally, the projected reduction in automobile purchases will derive as much from a levelling off in disposable income per capita as from the energy crisis.

If consumers' expenditures have played a dominant role in the economy recovery in 1973, investments, for their part, will now ensure the continuation of expansion by enabling us to increase our production capacity. Last year the economy showed some signs of overheating, since it was operating at full capacity in many sectors, and this situation gave rise to steadily longer delays in the deliveries of orders on hand. The need for new capacity, plus corporate profit performance over the last few years and the increased self-financing capacity of business enterprises, will motivate firms to invest in plants and machinery -- a trend already evident in 1973. During the first nine months of last year, in fact, investments in nonresidential construction and in machinery and equipment increased by 12.1 percent over the corresponding period of 1972. Capital investment for industrial expansion could increase by 12 percent in current dollars in 1974 and perhaps even exceed this figure -- a projection confirmed by the results of the latest government survey on investment intentions which puts the growth in new investment next year as high as 21 percent in current dollars.

The restrictions with respect to the supply of credit for mortgage markets, due to a hike of the interest rate, will bring about a slowdown in housing expenditures. This trend was already evident in the third quarter of 1973, when expenditures declined by 25 percent in comparison to the previous quarter. This tightening of credit, combined with a shortage of building materials and some basic materials, will lead to a reduction in the number of housing starts to about the level of the Council's target -- 245,000 housing units per year for the 1973-76 period. This contrasts with approximately 260,000 starts in 1973.

During the current phase of expansion, inventories were at an exceptionnally low level. With a decline in the growth of consumer expenditures and a weak inventory-to-sales ratio, we expect them to increase during the year.

On the public sector side, government current expenditures will continue to grow at a slower pace in real terms. Fiscal policy proved to be expansionary in 1973, especially if one considers the reductions in personal income tax, and the increase of family allowances and old-age pension.

Taking into account the indexing of these last two programs to the cost of living -- applied as well on personal income tax -- transfer payments should grow at least as fast as the increase in the consumer price index, if no allowance is made for the lag in adjustment. Thus, government expenditures will increase more rapidly than revenues during the current year. In order to stimulate investment, the government granted fiscal abatements in 1973, such as a reduction of the tax rates of corporations in the primary and secondary sectors and the removal of some indirect taxes at the corporate level. Governments' gross fixed capital formation will continue to expand at the same rate in 1974 as in 1973.

On the external side, as I have noted, the commercial setting will be less favourable than during the last few years. The energy crisis will deeply affect our exports, especially in view of the situation currently prevailing in the world. In the more favourable external environment, in 1973, Canadian exports increased by 9.3 percent in real terms during the first three quarters of the year. On the other hand, there was a decline in the real rate of growth of our exports during the third quarter of 1973, due in significant measure to strikes in the transport and pulp and paper industries, a reduction of American demand for automotive products and lumber, and the weakness in international markets for our metal exports. The projected slower growth of disposable income per capita in Canada this year will have a negative effect on domestic demand, so our imports will increase at a less rapid rate than in 1973. In real terms, imports should rise by about 4 percent in 1974, sustained largely by purchases of machinery and equipment required for large-scale investment projects. The overall effect of these trends will be a worsening of our current account balance producing a deficit of approximately $1.5 billion in 1974. (I might note here that during the third quarter of 1973, the surplus in our merchandise trade balance was already sliced by more than 50 percent).

The rate of advance of the Canadian economy in 1973 obviously contributed significantly to the rise in total employment of 5.2 percent, or 430,000 workers, over the 1972 level, exceeding labour force growth and thus appreciably reducing the unemployment rate from 6.3 percent in 1972 to an average of 5.6 percent last year. The slowdown of domestic demand together with the reduction of exports this year, might well lead to labour market deterioration.

On the price side, performance in 1973 was, of course, poor. During the first nine months of the year, the GNE deflator increased by 5.8 percent. Given current economic conditions, persisting bottlenecks for basic products and the costs of energy, significant slowing of the rate of increase of prices is unlikely in the near future. However, prospects are better for food products, such that some of the pressures will be relieved in this sector and this should reduce the growth of prices. But, of course, weather forecasting is difficult -- especially over such a long period.

On the housing front, the expected reduction in residential construction activity in Canada and the United States should improve performance with respect to building material prices. By contrast, however, the upward trend in the price of oil and petroleum products started in 1973 will continue in 1974. Taking all these observations into account, the pace of increase of prices will exceed that of 1973.

The Consumer Prices Index advanced by 7.6 percent in 1973, as against 4.8 percent in 1972 and spiralling food prices were the main culprit, having increased by 14.6 percent.

Against the background of the perceptible economic trends for 1974, what would be a satisfactory performance of the Canadian economy in 1975 and 1976? To answer that question, we must examine recent economic developments within the framework set by the performance indicators developed by the Council in its Ninth and Tenth Annual Reviews. These indicators, as you may know, represent a set of targets covering the main economic aggregates applied to a three-year period. They serve both as targets for satisfactory and realistic economic performance and as criteria for assessing actual and projected performance. Such a framework allows periodic comparison of progress with objectives, analysis of the divergences and assessment of their significance for the future.

The setting up of performance indicators implies the formulations of assumptions. What is the Council's scenario for the year 1973-76? To what extent must it be revised in the light of the latest developments? The 6 percent target set for the growth of Real Gross National Product is still valid. The strong growth of the U.S. economy in 1973 will be followed by a definite slowing down of production in 1974. However, the American economy should gather momentum in 1975 and 1976. We had postulated an average annual growth rate of 7.8 percent for Japan and Western Europe, but, despite the difficulty of assessing the full impact of the oil shortage on those countries, it is now evident that such a growth rate simply could not be achieved in 1974. However, it is equally possible to forecast a subsequent improvement in these countries, which will enable us to come closer to our objective for the period 1973-76. Since actual growth will reach about 6.7 percent in 1973, a slower rate of growth for 1974 is still consistent with the achievement of our target.

For consumer expenditures, our target was set at 5.9 percent. This rate takes into account the strong growth realized in 1973, and implies a return to a more balanced growth for the rest of the period. There will be a re-orientation of consumer expenditures in the current year with purchases being concentrated on semidurable goods and services. The deceleration of the growth of real disposable income per capita confirms expectations about the slowdown of demand. This variable, which was rather weak during the period of slack in 1970, rapidly strengthened with the economic recovery and the implementation of highly expansionist policies by governments in 1971, 1972 and 1973. We think that these

factors will become less and less important and that the rate of growth will slacken markedly, compared with the pace of advance that has prevailed since the beginning of the expansion period. Because of the rapid rate of increase in 1973, there should not be any problem in achieving the 4.2 percent objective set in the Economic Council's 1973-76 scenario.

Cyclical growth will be fed by an investment boom which will help to eliminate the bottlenecks observed in some sectors of the economy. Our target for the increase in fixed investments is 9 percent. On the basis of the strong growth of the housing stock in 1973, the objective of 245,000 starts for the period 1973-76 is likely to be achieved, as I indicated earlier, despite the slowdown expected this year. This slowdown would result, above all, from a shortage of building materials, which can be only temporary. Machinery and equipment expenditures will continue to grow in line with the gradual implementation of capital investment projects. As far as expenditures on nonresidential construction and on machinery and equipment are concerned, our objective could well be exceeded, as suggested by the most recent government survey of investment intentions. This target takes account of the implementation of large investment projects like the James Bay Power Development and the Mackenzie Valley Pipeline.

The high level of utilization of industrial capacity, the excellent demand prospects for the period covered, the stimulation of investments through tax reductions, the construction of a pipeline between Sarnia and Montreal and the probable development of the Athabaska tar sands, all of these are factors that should further the achievement of our objective over the period. The increase in crude petroleum price will encourage the development of alternative energy resources. Until then, investment projects for 1974 will be concentrated in the manufacturing sector where an increase of 46 percent this year is expected, with the highest shares going to the steel, chemical, pulp and paper and petro-chemical industries.

The target for government current expenditures remains unchanged at 5 percent per year.

Due to strong world growth, and also to the depreciation of the Canadian exchange rate in relation to those countries, the foreign demand for Canadian goods and services was strengthened during the last two years. As far as exports are concerned, the slowing down of the American economy in 1974 and the subsequent recovery will be the two key determining factors.

In the Tenth Annual Review, the import indicator was raised from 6.5 to 7.5 percent to account for the underestimation of current imports and also for additional imports required by the large capital investments in energy development. The negative effect on imports, induced by slower growth of real disposable income per capita, will be largely offset by our exceptional requirements for specialized machinery and

equipment. The combination of export and import targets results in a deterioration of the current account balance and in an increase in foreign financing.

At this stage in the expansion, a drop in productivity is to be expected. However, despite lower productivity gains in 1974, the exceptional performance registered in 1973, together with the promising prospects for 1975, as a result of the investment boom and the upward trend of demand, will mean that we will not have to adjust this objective downward.

In spite of the high level of production, the unemployment rate remained high in 1973, because of the exceptional growth of the labour force as compared with the three preceding years. The labour force has, in fact, increased more rapidly than was anticipated. In 1973, employment grew by 5.2 percent, compared with 3.1 percent in 1972. A more moderate growth this year will enable us to attain our employment target. The 4.7 percent unemployment rate projected for 1976 will be possible if labour force growth slows down substantially or if the employment level increases as a result of the implementation of investment projects. Since the emergence of the energy crisis, this primary objective seems to warrant even more attention on the part of governments.

Up to this point, I have examined the performance of the economy and assessed the medium-term prospects within the framework of the performance indicators. I will conclude with a very brief perspective on the future of agriculture in Canada, but first, I think that agriculture must be viewed in the context of the whole economy.

During the sixties, agriculture account for 7 percent of total output. Recently, this proportion has dropped to 4.8 percent. This sluggishness has been due, in part, to relatively low wheat exports at the end of the sixties and during the early part of the seventies. In general, since World War II, the agricultural sector in Canada has been characterized by overproduction. Export markets were used to dispose of our surpluses rather than to ensure a continuous source of supply for importing countries. In recent years, major wheat purchases by China and the U.S.S.R. have shifted our position from one of excess supply to shortfall.

Employment in agriculture is continuing its downward trend. In 1970, it represented only 7.7 percent of total employment, compared to 13.3 percent in the sixties. In absolute terms, as well, the numbers are declining. These changes, due to the migration of the agricultural population to urban centres, add to the number of jobs that must be created in the other sectors of the economy.

The increasing output, accompanied by a reduction of employment, has given rise to a rapid advance of agricultural output per person employed. Indeed, the agricultural sector is second only to forestry in the ranking of productivity increases during the period 1960-70. Productivity gains reflect a greater capitalization of farm operations which has produced

a consolidation into larger operational units. This capitalization manifests itself through increased investment and a rise in costs of operations, i.e., interest and machinery expenditures. The rise in operation costs, the capital base required to buy a farm in the face of uncertain return prospects, and tha inability to offer wages capable of competing with other sectors in the economy are all factors that explain the lack of attraction of this sector and the decreasing number of units, especially of the family type. Many of these had to disappear for financial reasons. With a reduced profit margin, they could not adapt to the rapid technological changes caused by the rise in operational costs and international competition.

Following past trends in this sector, and in view of the upheavals it has experienced, what will its medium-term future be? Recent problems in foodstuffs supplies on a worldwide scale have forced us to revise our expectations. According to the Tenth Annual Review, the growth rate of agricultural output will be 3.5 percent annually during the period 1973-76, somewhat higher than the trend observed in the period 1968-72. World demand for foodstuffs and feed grains will remain high during this period, as demonstrated by the Chinese and Soviet purchases. These facts have led us to revise our goal upward to 5.6 percent, about in line with the rate for Real Domestic Product. The situation of our agricultural exports will depend largely on the evolution of world demand and our ability to develop export markets and products in the face of unstable international demand and prices. Over the longer term, prospects for world demand are very good. This situation is, of course, largely dependent upon climatic conditions.

During the period 1973-76, productivity gains recorded in agriculture will occupy first rank, reaching 7.6 percent compared to 2.4 percent for the economy as a whole. Such a performance will necessarily require an increased capitalization if we want to achieve our productivity goal, because employment will go on deteriorating during that period. Capital requirements of the agricultural sector will come into conflict with those of other sectors of the economy, particularly those associated with the development of our energy resources. This will require increased credit facilities and improved management techniques to allow the agricultural sector to face internationl competition and to develop export markets.

This Conference constitutes an example of the "concertation" that the Economic Council has proposed in its latest Annual Review. When it is seen as a common view of the economic future, this process of harmonization of efforts will make it easier to formulate problems clearly, as well as to throw light on the various medium-term solutions possible and to assess the consequences of the decisions to be taken.

WORLD FOOD SHORTAGE

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The outlook conference this year is taking place in the shadow of a worldwide food shortage, and this is the subject on which I have been asked, on behalf of the Food and Agriculture Organisation of the United Nations, to address you today. I would like to focus on three questions:

- what are the reasons for the current food scarcities?

- has the shortage come to stay, or is it a short-lived aberration?

- what are the consequences for future world food policies?

For all of us, the past 2 years have witnessed a period when the unexpected occurred - and it has kept on occurring. It has been a period of high food prices in all countries, of near-famine in some, and of increasing consumer resistance to the inflation in food costs in others. World wheat prices, having rocketed to $5 a bushel in the summer, have reacted to record crops by rising still higher to nearly $6. Producers in many exporting countries have enjoyed a windfall after 20 years of seeing their prices falling in real terms, and eroded by inflation. But, in reaction to this, consumers in rich countries of the West have been organising boycotts against high meat prices; in some poor countries of the Far East the grain shortages have caused serious riots and strikes. In West Africa food became so cirtically short last year that emergency air-lifts had to be arranged, and a major relief operation organised. It was a period in which the Peruvian catch of anchovy - a major world source of fish meal - dwindled drastically and helped to create such a powerful demand for soybeans that the U.S. Government was induced to limit exports. The U.S.S.R. became the world's largest-ever single wheat importer, world grain stocks were depleted to their lowest level for 20 years and food aid shipments were drastically cut.

Why has all this occurred - and why is the shortage so persistent? In part, it reflects a highly unusual combination of circumstances, especially the onset of bad weather simultaneously in many parts of the world - and in some areas, was the culmination of several unfavourable seasons. And the effect was intensified by international currency disturbances. But it also reflects longer-term trends. There are more people to feed and they have more money to spend. The world population is growing by about 80 million people a year, and with rising incomes people's eating habits are changing. It also reflects basic changes in government policy, in particular in the U.S.S.R. which decided on massive imports instead of cut-backs in consumption in contrast to earlier occasions of poor harvests.

And it reflects a disappointing performance from agriculture in the developing world.

Let us begin, then, by looking in greater depth at the food situation in developing countries. Poor harvests, you may recall, had been widespread in 1972; the FAO index of food production showed no increase at all for developing countries, and there was an overall fall in the world index for the first time since the war. On a per caput basis, food production appeared to have fallen even below the average levels of the early sixties.

We therefore awaited the outcome of the 1973 grain harvests with great anxiety, because, in FAO secretariat's view, the low stocks available to offset production shortfalls could have meant a worldwide physical deficit if there was another crop failure in a single major producing area. This exposed situation into which the world had stumbled seriously alarmed us in Rome - in fact, at times in 1973 we seemed more alarmed than several of our member governments. Countries had taken steps to encourage increased plantings, but the fact was that the harvest was at the mercy of the weather. Well, as it urned out, the worst did not materialise, at least not last year, although this was more by luck than judgement.

By good fortune, the monsoon (which had been so erratic in recent seasons) was favourable in the Far East, so that production of rice - the staple food in this heavily populated food-deficit region, has recovered materially. And, of course, crops in North America and the U.S.S.R. reached record levels. But in other areas the situation is still precarious. In some it is outright critical, due to the poor crop conditions at home coinciding with short supplies and the high prices of the major foodgrains abroad. Indeed, poor crops and food shortages were reported for an unusual number of countries throughout 1973. The FAO maintains an Early Warning System of Food Shortages, and its latest report lists no less than 14 countries with current shortages. Fourteen more countries face a danger of poor harvests.

For, despite its promising autumn crops, much of the Far East still faces a season of scarce and costly food, and some of the national food distribution systems are badly hampered by inadequate operating stocks, and by hoarding by farmers who are holding back for even higher prices. Production in some countries has been slowed by inadequate supplies of such essential inputs as high yielding seeds, fertilizers and pesticides. This year's output, it must be remembered, has not only to meet the constantly rising food requirements of growing populations, but should also allow at least a modest replenishing of food stocks as a minimum insurance against the possibility of future crop failures.

In Latin America, another region where per caput output declined in 1972, preliminary estimates suggest a rise in food production too. Wheat production declined last year, mainly due to the unfavourable weather in Argentina, but the regional production of maize, other coarse grains and rice was larger. Livestock production also appears to have increased in Latin America, if only on a moderate scale.

In the Near East, drought has affected both crop and livestock production in several countries, and the region's food production may fall by 3-4%. While irrigated crops were little affected, grain crops (which are mostly grown under dryland conditions) were out drastically in the drought-affected countries. Some parts of the Near East have had only partial breaks in dry conditions lasting over several years. Livestock production is likely to fall in most countries due to the poor condition of pastures.

Yet of all developing regions, Africa is in the most difficult position. Following a year when there was very little expansion in food production, the region was affected by widespread production setbacks in 1973, and is now very exposed to shortages. The six countries in the West African Sahelian zone are still suffering from the after-effects of the severe droughts of 1972. Crop production is lagging, and livestock resources, a major source of their livelihood, have suffered enormous losses. Towards the end of last year, the FAO organised a multi-donor mission to the zone (in which Canada was represented as well as several other countries and international agencies) to carry out an on-the-spot assessment of the situation. The grain crops in the northern zones of the Sahel will once again be in deficit in 1974 and the mission concluded that continued international aid will be required, both to prevent famine and to launch rehabilitation programmes. The FAO and UN issued a joint appeal in November for $30 million in cash and 500,000 tons of food to combat this continuing emergency. Total needs could eventually go as high as 1.2 million tons.

Outside the Sahelian zone, too, drought has reduced crops in a number of countries in West and East Africa, and is still affecting crop prospects.

This rather gloomy story raises the issue of whether the so-called "green revolution" has failed, and brings me to my second question: is the world food shortage here to stay? As you know, some authorities have recently been forecasting the scarcity continuing for the rest of the 20th century, pointing to the disappearance of surplus stocks; the lagging production in developing countries; the escalating rise in demand for meat and its effect on grain utilisation; the rising farm costs because of the energy crisis and wage inflation; the dwindling land resources; and so on.

We, in FAO, however, think this presents a one-sided and over-simplified point of view. The fact is that we have entered a period of rapid and radical change - with dramatic developments in the world's monetary situation, in the energy position, and in international political relationships. All these events will probably have lasting effects on the structure of agricultural production and trade, and there will have to be a period of adjustment before the full consequences can be assessed. There has been much talk, for example, of the indirect effects of the higher oil prices on the petro-chemical industry, and hence on fertilizer costs. There is also the question of the possible depressing effects on national incomes, which could lead to reduced consumer demand for products such as meat and consequently for feedstuffs too. And how will

the changes occurring in relative currency values affect the pattern of exports and import demand? These kind of issues or questions can be posed, but no one can yet say what the outcome will be.

Leaving aside these unpredictable external developments, however, there are other factors - within the agricultural scene itself - which could contribute to a growing instability in world commodity markets. In any one year, the edge between surplus or shortage is very narrow. Now that North America's grain stocks, which for 20 years have provided a ballast against the ups and downs in world demand and supply, have been depleted, they will take several years to replenish. In fact, the margin of safety has been shrinking for some years, with world grain stocks falling to only 7 weeks of the world annual consumption in 1973. Meanwhile, the U.S. Government has informed FAO that, while meeting its responsibilities as a major commercial wheat exporter and food aid donor, it can no longer be expected to carry such a large share of the financial burden of holding buffer stocks for the entire world. So there seems to have been a permanent change in this sector.

Another source of increasing instability in world food markets is the fact that, there are now three very large areas accounting for almost one-half of grain consumption and world population - the Soviet Union, India, and China - which are normally close to self-sufficiency in grains. They are close to self-sufficiency also in vegetable oils. Given the fact that only a small fraction of their consumption of these products is imported, relatively small fluctuations in production have - in the absence of sufficient stocks - a magnified impact on their import requirements and on international prices.

The scarce information available to the outside world not only on early production prospects in the U.S.S.R. and China, but also on their stock levels and trade policies, makes the trade performance of these countries particularly unpredictable. This is the third time in the last decade that the U.S.S.R., normally a wheat exporter, has entered the world market as a major importing country on an unexpected scale. Recent large purchases of sugar and soybeans by the U.S.S.R. also gave a strong boost to markets for these commodities.

The involvement of China and the Soviet Union in international commodity trade has been a positive factor in expanding effective demand for agricultural products. But, at the same time, it has added elements of uncertainty. To repeat: this is because, for some commodities, their exports and imports are only a fraction of their domestic supplies or requirements; because political considerations are a major determinant of trading decisions; and because of the lack of information in the outside world concerning the state of crops and stocks in these two countries. Fortunately, additional data are becoming available on the Soviet Union, and now that China has resumed its seat in FAO we are hoping to receive more official information on its agricultural position too.

Another source of future instability may flow from the effect of the present high prices and limited world supplies. It has already stimulated

increased grain, meat and soybean production in a number of exporting countries - and prices have risen so abruptly that the possibility of an over-reaction and over-supply cannot be ruled out. But one man's "price" is another man's "cost". Some serious price/cost distortions have arisen - for example in the dairy sector of countries like the U.K. where feed costs have jumped while milk prices have remained fixed: this has already reduced milk output.

Apart from this, there is the impact on importing countries where the rise in food prices has become a serious element adding to general inflationary pressures. If such governments decide they cannot rely on the world market as a dependable source of supplies at reasonable prices, this may - in fact, already has - further encourage policies of self-sufficiency. For example, the restrictions imposed on soybean exports last year, even though temporary, were a serious shock to Japan which depends on imports for its traditional foods and seasoning agents. Similarly, the massive cost of Italy's meat imports - now about $1 billion a year and singled out as a major cause of the exceptionally large trade deficit in 1973 - has led to a new 9-year investment plan to encourage domestic livestock production. In the Common Market, generally, the high world food prices have greatly muted to voices previously urging a reform of the Common Agricultural Policy.

And there are other complicating factors such as the effect of the unstable foreign exchange markets on commodity trading and stockholding.

In short, the world food situation is now being affected by so many inter-related factors - some from within agriculture and some from outside - that past trends and past experience may no longer be a reliable guide to the future. Over the medium-term, several factors point, not so much to either persistent shortages or surpluses, but to a period of instability, where the international community will have to be prepared to react quickly to changing events. For the present, we have to keep our options open, as the basic parameters are shifting so erratically or to make medium-term forecasting a very perilous business these days.

Turning now to the third issue - what are the consequences of this uncertain situation for world food policies? The central need, in FAO's view, is for a more coherent world food security policy. This requires, firstly, adequate food production to meet the changing requirements, which in turn means reasonable incentives to the world's farmers, and increased development assistance to the developing countries in particular. We expect this vital issue will be taken up at the UN World Food Conference later this year.

Another requirements for a world food security policy is international action to ensure there are always sufficient stocks of grains and rice, the staple foodstuffs, to maintain a continuity of world consumption and to offset crop fluctuations. The FAO's governing body, in fact, already endorsed last November the basic objectives and principles of such a proposal, and Canada in particular has taken a very positive attitude to it. This proposal involved 3 main elements:

(1) Coordinated action by all countries, importing and exporting, rich and poor, to maintain national carryover stocks according to certain international guidelines, to make sure there are always globally-adequate supplies available;

(2) Regular consultations between governments to assess the overall adequacy of stocks and to advise on problems which arise; and

(3) assistance on stocks to developing countries to build up their own national food reserves, so that they can also participate effectively.

The consultations on stocks will take place, it has been agreed, in the FAO Council, our central food policy forum. As regards aid to developing countries, a series of FAO missions are being organised to advise food-deficit countries on their national food security programmes, and the possibility of regional reserve stocks is also under consideration.

However, the key element - i.e. the international action on national stocks - has still to be hammered out in detail by governments, who will be meeting in Rome in June for this purpose, and the subject may also be taken up later at the World Food Conference. This is not the time or place to go into detail, but perhaps I may refer to one issue which has been queried - and that is whether a coordinated stock scheme would have a depressing effect on commercial markets and farm prices. We do not think this need be so. Everyone agrees there have to be enough stocks in the world to offset crop variations. In fact, current stock policies, which were not designed to deal with the current situation, are <u>already</u> being reassessed by many individual countries on a unilateral basis. World stock patterns are already changing, and the real question is whether stocks will be built up haphazardly, with dubious effects on food security and market stability, or built up in an orderly fashion according to some internationally acceptable criteria. Probably there is a much greater danger of markets being lost through the adoption of self-sufficiency policies by importing countries if they lack confidence in the continuity of supplies, than through a coordinated stock holding scheme. But, all the same, we agree that the commercial implications of stock policies have to be carefully considered and allowed for in future consultations on this subject.

The second major consequence for world policies concerns <u>food aid</u>. Food aid is vital for ensuring food security, because those countries which are most vulnerable to serious shortages are usually those least able to afford the extra cost of imports. Last year the total volume of food aid shrank to less than 4 million tons of cereals - about one-half the average for the previous 3 years - just in a period when it was most urgently needed. In FAO's view, this experience showed clearly the need to establish, once and for all, that food aid is not mere surplus disposal, but long-term development assistance; and to set up a system which ensures there is a continuity in food aid supplies, even when commercial markets are tight. Not only national programmes, but multilateral and voluntary food aid agencies have been badly affected by the sudden shortfall in their resources. This has had a

particularly disruptive effect on the UN/FAO World Food Programme, to which Canada is a generous contributor. The higher world prices have cut the WFP's real resources by about one-third below requirements, and it has had virtually to suspend its work on new projects. Even so, there is still a resource gap. A longer-term policy for food aid (to which stock policies are clearly linked) is thus another subject deserving serious consideration.

Finally, a key element in achieving a better world food security is better information and better outlook work - one of the purposes, of course, of this conference. It may be a truism to say the world is growing more and more interdependent; but it is a fact, both in economic and political terms. One of its implications is that everyone involved in food production, marketing and trading needs to have better access to international information of all kinds - crop prospects around the world, current prices, stock levels, commodity sales and shipments, the situation for vital agricultural inputs like fertilizer, the effects of currency changes - all this, and more, is required to make a better judgement of the market situation so as to help farmers, traders and governments to adjust quickly to a rapidly changing situation. For this reason, FAO is now strengthening its arrangements for collecting and analysing economic data. We are in the process of setting up a "food information system" to provide a continuous watch and assessment of international food developments. The FAO's role will be to provide a focal point and a central source of intelligence on food development, and the success of the system will depend heavily on the close cooperation of Canada and the other major food producers and exporters. We hope that the new coordinator of the FAO Food Information System will be able to attend future sessions of your conference, and obtain the benefit of Canadian views and judgements.

In conclusion, may I sum up how the FAO sees these basic issues.

The present world food shortage - probably unprecedented in its extend and impact on such a wide range of commodities - originated through a combination of short-term events being superimposed on longer-term trends. But this has now been joined by radical economic changes, arising outside the agricultural sector, whose consequences for agriculture cannot yet be fully assessed. The medium-term food outlook, therefore, has never been so unpredictable and potentially so unstable. As a safeguard against these uncertainties, we shall need a more systematic world food security policy and a closer coordination of national adjustment, food aid, and stock policies.

CANADIAN PRODUCTION POTENTIALS

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Our commodity production potentials relate to our ability to harness our climate and soils with today's and tomorrow's production technology:

CLIMATE

The overall limiting factors as far as production is concerned are temperature, rainfall, and daylength. Generally, we must work within these limitations though science and technology have supplied some means of alleviation, e.g., breeding for crops which will initiate spring growth when the soil is still cold and which will exploit long summer daylengths in a short growing season, optimizing the use of water through conservation and irrigation, artificially raising the temperature with aids from such products as glass, plastics, and paper; and processing and storing products to meet animal and human requirements from one cropping season to the next.

LAND

Canada, the second biggest country in the world, encompasses 3,851,809 square miles. The biggest part of this land mass lies at latitudes where there are only a few weeks of the year free from frost, or permafrost prevails. On the plus side of the ledger, the land mass includes some 291,571 square miles of fresh water. Today, only about 169,669,000 acres of our land are in occupied farms. Of these, some 108,149,000 acres are improved while 61,520,000 are native pasture and woodlands.

Only most conservative estimates of undeveloped potential farm land exist and they are in terms of yesterday's opportunities. For example, in 1970 Ehrlich estimated that about 50 million acres of undeveloped land have potential for forage crop production. An important fact is that the development of technology is making us more and more independent of native soil capability, whether mineral or organic soil. This independence, however, is achieved only at an increased cost of inputs. Therefore, the developing interest in policies and programs to reserve fertile, climatically well-suited and geographically well located lands for food production is long overdue.

INPUTS

We have great undeveloped natural resources adaptable to agricultural production. However, they will only be converted into economic resources

and used in fulfilling agriculture's roles if the market place or the Government provides an incentive through some recognizable return on the inputs involved.

These inputs include capital, labour, machinery, energy, fertilizers, feed pesticides, transportation and the technology of their use. Generally, we have been substituting capital and technology for labour to increase the efficiency of production. This is reflected in the increasing use of all inputs except labour.

Currently, there is a tight supply of most inputs due to market imperfections and/or increasing use coupled with distribution problems. The consequent rapid escalation of prices is reflected in the increasing costs of production on the farm.

Fertilizers are a good example. The North American fertilizer industry did not forecast and prepare for today's increased domestic and export demand. Only five years ago it was overbuilt with too much capacity for the production of each of nitrogen, phosphate and potash. Hence today, inventories are low and the situation is complicated by logistics problems. The industry has depended on low cost supplies of natural gas, phosphate rock and sulphur. North American supplies of these inputs are now tight and becoming more expensive. Canada is in a preferred position as far as natural gas and sulphur are concerned. On the other hand, we have depended entirely on imported phosphate rock and the situation in regard to price and supply has not as yet sparked any real interest in less suitable Canadian apatite. Our used capacity for nitrogen and phosphate fertilizer has been based on export of about one-third of production. For 1974 our increased domestic demand will be met by a decrease in exports.

As far as potash is concerned, we all know that in the late sixties our capacity to mine was enormously overbuilt. With quotas rising, the Canadian potash industry is on its way out of the doldrums.

Summing up the Canadian fertilizer situation, we have a seller's market and marked escalation of prices. In the short run, we are faced with logistics problems in distribution, particularly in Eastern Canada with its former partial dependence on imports from the United States. Fertilizer dealers will have to take fertilizer any time they can get it.

In the case of pesticides there is growing concern that the supply may be insufficient to meet the needs of food production. In our concern over the environment we have considered it prudent to abolish the use of some wide spectrum, persistent chemicals in favour of much more expensive but short-lived compounds. I am informed that today there are world-wide shortages of malathion and lindane. Some of our Eastern provinces are depending on a volume supply of fenitrothion to control the spruce budworm in forests. The supply is tight and dimethoate, the pesticide recommended in protecting crops against the grasshopper, is being or will be purchased by forest interests as a

second choice to fenitrothion. I merely point out that the availability of effective pesticides could become a limiting factor in food production.

Mr. C.G.E. Downing in his following presentation will tell us how another input, energy, relates to production costs.

PRODUCTION POTENTIALS

Any discussion of production potential is a great game of "supposing". Are we going to suppose that we maximize the use of our physical resources and today's technology? Are we going to suppose that our potentials are limited to what we can produce and market in competition with other trading nations? Are we going to suppose potentials based on as yet unforeseen and uncalculated advances in technology?

I expect our production potential should be considered in the light of the roles of agriculture:

(a) As the main food provider for the nation

(b) As a money earner on world markets

(c) As a producer of food for food aid programs.

Let's look at a few commodities, remembering that we should allow for competition between commodities for land and other resources.

BEEF

There is good agreement that a primary constraint in beef production is the availability of hay and pasture to accommodate a growing cow herd. In 1970, we estimated that without infringing on land presently allocated to grains and other crops we could increase hay and pasture production to accommodate some 20 million additional beef cows. Much of this increase, some 7.9 million head, could be possible by widespread application of today's technology to the acreage now used in hay and pasture. The increase through development and utilization of the some 50 million acres of potential agricultural land not now in farms was another 11 million head. Finally, we allowed an increase of the equivalent of over a million head through increase in productivity of the present beef cattle population.

These sort of figures are only science fiction except when considered in relation to favourable price relationships between inputs and product. The value of the product either on the market or to society must exceed cost of production by the margin required to provide the incentive to production. Other basic requirements are:

(a) a high degree of education and practical skills, and

(b) aggressive management.

An Agriculture Canada Study in 1973 concluded as follows:

"Beef production can be increased by 30 percent in 1980 by increasing the number, and to some extent, the average size of the animals marketed. Within limits, size of carcass could be increased immediately to result in increases in total yield. The major increases in beef production will occur in Western Canada.

"A continued expansion of beef production depends upon expansion of the beef cow herd which is dependent upon increased forage production. Greater forage production by about 50 percent can be achieved by improved management of existing pasture and hay land, as well as seeding more acres to forage crops. The feedlot segment of the beef industry is not a limiting factor to increased beef production. The supply and price of feed barley and corn relative to beef will be the major factors in expanding the feedlot industry."

WHEAT AND FEED GRAINS

Any study and projection of production potential for wheat is complicated by the mix of commodities (wheat, oats, and barley and to some degree oilseeds) competing for prairie lands. We have all been well schooled in the idea that with present technology we could produce a billion bushels of wheat on 30 million acres of land. This assumes raising our average yield from 24 bushels per acre to about 34 bushels. This is quite within reach on a good year in terms of weather. Our better farmers are achieving or bettering it today. However, in the long haul we may wish to allocate less than 30 million acres to milling and baking wheat and to ensure supplies of feed grains and oilseeds for both domestic and export markets. Perhaps, it would be wisdom to grow about 25 million acres of wheat which at 34 bushels per acre would yield a crop of 850 million bushels.

I think, however, that we should be cautious in our expectations of improved yields of grain crops on the prairies. It is true that with optimum soil and crop management including better control of diseases, weeds, and insects, increased use of fertilizers, and reduction of harvest losses we can improve average yields and to a degree mitigate the effects of climate. We can gain acres by reducing summerfallow. However, we must remember that rainfall and its seasonal distribution is the primary limiting factor in the potential production on wheat and feed grains on the prairies.

Our potential to produce feed grains in support of our livestock industry is also far beyond current performance. For example, the 10 year average (1963-72) yield of barley was 38.5 bushels per acre and oats 47.6 bushels. Good husbandry, without using more land, could easily raise these yields 30 or more percent. In Eastern Canada a chief limitation in crop production seems to be lack of adequate drainage. This is in spite of ample evidence that investments in drainage will double or triple yields on many of our fields with resultant recovery of costs in not more than two crop years.

MILK PRODUCTION

Let's look at milk production. The national dairy herd of about 2.2 million cows averaged about 8,010 pounds of milk in 1972. At the same time some 100,000 holsteins on record of performance averaged 13,328 pounds in 305 days, and some 80 percent of the dairy cattle in Canada are holsteins. The production of the holstein class leaders ranged from 21,548 for a junior two year old to 30,007 for a mature cow. There seems little doubt that, with improvements in nutrition and management, and wider use of our best bulls through artificial insemination, we could come close to doubling today's production without increasing the size of the national herd.

CONCLUSIONS

I have perhaps said enough to illustrate that projecting Canada's production potential with the assumption that all inputs are available as well as aggressive management and an economic incentive can be a pleasant pastime over a bottle of beer, but not necessarily practicable.

I do want to leave these thoughts with you:

About eight billion acres of the globe's 32.5 billion acres are susceptible to crop production. We have about 2.3 billion acres of this land, with perhaps 250 million acres susceptible to crop production. Worldwide, 56 percent of the potentially arable land is not being used for crops. In this context, we probably use less than half of our arable land; South America 11 percent, and Africa 22 percent.

There are serious limitations on much of the land in South America, Africa and Australasia, because it is either desert or tropical. There is a potential for three crops a year in the tropics though soils are generally seriously deficient in nutrients and subject to laterization (hardening).

Canadian production potential is limited by its geography to a short growing season for annuals and to those biennials and perennials which will survive our winters.

A big Canadian advantage over countries with more temperate climates is that we enjoy relative freedom from devastating plagues of diseases and insects.

Also, Canada has relatively bountiful supplies of fresh water to exploit in crop production.

I conclude that we are well equipped by nature to offer a wide spectrum of Canadian agricultural products domestically and on world markets. We are safer in the long run to avoid a monocultural approach to agriculture from the standpoint of avoiding production catastrophes and fickle markets. Given markets, we are far from reaching our production potential in any commodity be it fiddlehead ferns, wheat, beef, or potatoes.

Finally, a chief constraint is money and quoting William and Paul Paddock: "Any land, even a mountain top can be brought into cultivation if enough money and labour are put into it."

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ENERGY AND AGRICULTURE

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Energy Input in Canadian Agriculture

Canadian agriculture's greatest achievement has been an increased output of quality food at very modest increases in price over the last three decades. During this period the value of implements and machinery has increased from one-half billion dollars to $4.5 billion, and in addition, farm operating expenses and non-farm inputs have increased markedly for such items as fertilizers, petroleums, chemicals, etc. In 1971 farm operating expenses amounted to approximately $3 billion. One-half billion dollars of fossil energy and derived products were used directly in these farming operation. The gross farm output for this year amounted to $4.5 billion.

Agriculture is one of the largest users of petroleum products in Canada, consuming 7.9 percent of the gasoline and 12.2 percent of the diesel fuel. The range in utilization is 3 percent and 2 percent respectively for gasoline and diesel in the Maritimes, and 34 percent and 45.6 percent respectively in Saskatchewan. This direct farm expenditure on petroleum products represents more than 10 percent of the operating cost of Canadian farms. In the Prairie provinces it is between 15.4 and 17.5 percent, while in the East and B.C. it is between 5.7 and 7.8 percent. Thus, any increase in petroleum prices or reduction in supply would have a significant impact on the operating cost and/or the output of Canadian agriculture, particularly in the Prairie region.

Energy Value of Agricultural Crops

The energy production in the form of crops produced involves an evaluation of the calorific value of the useable crops. The energy value of various crops varies widely with theoretical equivalents of 15 million BTU's per ton for general cereal grains, 17.5 million for oilseed crops, 14.4 million for forage crops, 12.5 million for straw and residue, 2.2 million for fruit crops and 1.8 million for vegetable crops.

A summary of such potential energy is given in Table 1.

The significant difference in the crop energy/acre between Canada and Saskatchewan and that in Ontario is related to the inclusion in the former of summerfallow acreage, whereas in Ontario this is not a factor. Also, in most crops the per acre production is much greater in Ontario with its higher moisture input and greater use of fertilizer.

Table 1 - Energy Value of Crops - 1971

	Canada	Sask.	Ontario
Improved Land - Acres	95.5×10^{6}	43.9×10^{6}	8.1×10^{6}
Crop Energy - BTU	109.0×10^{13}	35.4×10^{13}	23.6×10^{13}
Crop Energy - BTU/Acre	11.4×10^{6}	8.0×10^{6}	29.2×10^{6}

Cornell Review on Corn Production

The need to consider the relative value of crop production in relation to the amount and cost of energy input into agriculture is emphasized by the energy problems discussed in recent months. A recent report on Food Production in the Energy Crisis by David Pimentel et.al. of Cornell University gives a very good analysis of the energy input and the energy production of a corn crop. It accepts the fact that crop production depends heavily on energy inputs just to produce the raw products. In addition, large amounts of energy are consumed as raw products are transported to centres to be processed, frozen, canned, dehydrated, ground, baked and so forth. Farmers process little of their own food, being dependent themselves on the food processing, wholesaling and retailing industry. They also depend on a multitude of other industries to supply machinery, fertilizers, pesticides, improved crop varieties and other supplies. For every farm worker it is estimated there are two farm support workers. Thus about 20 percent of the nation's work force and industries are involved in supplying food. The farm support and food processing industry may use more energy than farming itself, thus emphasizing the dependence of our food system upon energy in all areas.

Corn production is used in this report as the basis of analysis since corn generally typifies the energy inputs in U.S. production. It is intermediate in energy input between the extremes of high energy demand fruit production and low energy demand tame hay and small grain production. This crop also is the highest user of fertilizer, particularly nitrogen fertilizer which has an exceedingly high energy input for its production and processing.

A summary of the analysis is shown in Table 2. This shows that in 1970 36 percent of the total energy input is for fertilizer input and application, 27 percent of the energy input is for fuel used in the farm production program, and 15 percent is used in the production, manufacture, repair, etc. of the farm machinery and trucks used on the farm. The miscellaneous category includes insecticides, herbicides, drying, irrigation, electricity, etc.

Table 2 - Energy in Corn Production - U.S.A.

		1945	1959	1970
Labor	(KCal)	12,500	7,600	4,900
Machinery	"	180,000	350,000	420,000
Gasoline	"	543,400	724,500	797,000
Fertilizer	"	74,600	429,100	1,055,900
Transportation	"	20,000	60,000	70,000
Miscellaneous	"	95,000	318,000	549,000
Total Inputs - KCal		925,500	1,889,200	2,896,800
Corn Yield (Energy Basis) - KCal		3,427,200	5,443,200	8,164,800
Output Energy/Input Energy Ratio:		3.70	2.88	2.82
Gasoline Used - Gals/Acre		15	20	22
Total Energy - EQ. Gals/Acre		25	52	80

Of major significance in this summary is that the yield during this 25 year period has increased 2.4 times and although the total energy input equivalent has been somewhat greater, a reasonable energy balance still exists. For a food-hungry world this kind of energy utilization has made an outstanding contribution. The Table also illustrates that, in relation to the increase in crop production, the actual fuel input increase was only 50 percent, although the total energy equivalent input increased three-fold. The item of greatest significance in this increase was the fertilizer input without which the yields could not have increased to the extent indicated. There are suggestions, however, that there may be alternative ways of obtaining the nitrogen fertilizer required, such as by greater applications of manure or by green manuring with a legume crop. The report also states that horses and mules are not satisfactory substitutes for machinery because of the large quantity of energy that they consume in feed (and a poor energy conversion and quality of meat produced. Author's comment).

Analysis of Canadian Crop Production and Energy Use

A similar-type energy comparison for Canadian agricultural production for 1971 on a broader base is given in Table 3.

Here, we find quite significant differences in the energy output to energy input ratios between Saskachewan and Ontario and the actual fuel and total energy equivalent on a per acre basis between the two regions as well.

In Saskatchewan, we have high energy crops being produced in abundance, such as cereal grains and oilseeds, in the most efficient and lowest cost mechanized production systems in the world. The mulch tillage practice is

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Table 3 - Energy in Crop Production - Canada 1971

	Canada	Sask.	Ontario
Direct Energy Use			
Fuel - Tractors, Combines - BTU x 10^{12}	56.4	15.5	10.6
Fuel - Cars, Trucks - BTU x 10^{12}	47.0	12.7	10.0
Electricity - BTU x 10^{12}	0.8	0.1	0.3
TOTAL DIRECT - BTU	104.2 x 10^{12}	28.3 x 10^{12}	20.9 x 10^{12}
Indirect Energy Use			
Machinery Production - BTU x 10^{12}	5.3	1.1	1.4
Car & Truck Production - BTU x 10^{12}	8.0	2.0	1.9
Fertilizer Production - BTU x 10^{12}	166.0	8.0	72.0
Miscellaneous - BTU x 10^{12}	56.0	8.0	19.0
TOTAL INDIRECT - BTU	235.3 x 10^{12}	19.1 x 10^{12}	94.3 x 10^{12}
TOTAL D.& ID. INPUT - BTU	339.5 x 10^{12}	47.4 x 10^{12}	115.2 x 10^{12}
TOTAL INPUT/ACRE - BTU	3.55 x 10^{6}	1.05 x 10^{6}	14.2 x 10^{6}
ENERGY OUTPUT (TABLE 1)/ ENERGY INPUT RATIO:	3.20	7.6	2.05
FUEL - GALS./ACRE	7.6	4.6	18.0
TOTAL ENERGY INPUT - EQ. GALS/ACRE	23.0	6.6	92.0

unique in its low energy input in minimum tillage equipment operated by large tractors and equipment at relatively high speeds. On the other hand, Ontario produces a large volume of fruit and vegetable crops of very low energy value, requiring an appreciable energy input in spraying and other mechanized activities with a fairly intensive tillage and inter-row cultivation system of field crop production with high inputs of fertilizer and pesticides.

Here, an important factor to consider is that undue emphasis not be placed on the energy output to energy input ratio because the production of good quality fruits and vegetables are of significant importance to the proper nutritional diet of homo sapiens and priorities for energy use must be placed according to needs and not simply on some engineer's or economist's analysis of efficient use.

Alternative Sources of Energy

There has been much discussion related to alternative sources of energy for agricultural production. Two of these are the utilization of crop residue and animal waste. Table 4 gives an estimate of these sources of energy based on "ball park" assumptions. These assumptions are that there

is approximately one ton of crop residue/acre in Western Canada and two tons/acre in Eastern Canada in most cereals, oilseeds and other such crops. It is estimated that at least one-half of this crop residue should be returned to the soil to maintain its humus and productivity and in some areas all of it, in order that there might be land on which to grow crops in the future (shades of the Dirty Thirties), and further that one-half of a ton of residue is required for each cattle animal housed.

Table 4 - Crop and Animal Waste Energy

	Canada	Sask.	Ontario
Potentially Available Crop Residue - BTU	23.4×10^{13}	11.2×10^{13}	2.85×10^{13}
Potentially Available Animal Waste - BTU	57.5×10^{13}	6.8×10^{13}	20.4×10^{13}

In regard to animal waste, it is assumed that in Western Canada, one-half of the cattle are on range or pasture full time and therefore their waste is left in the natural state and is therefore used effectively without creating a pollution problem and that the other half are housed for only half of the year in a manner in which their waste is accumulativable. In the East, it is estimated that most cattle are housed or are on feedlots for two-thirds of the year. The rates of production are obtained from the Canada Animal Waste Management Guide.

There are major problems associated with the utilization of this potentially free waste energy. The most significant one in regard to crop residue is the cost, energy input, labour, transportation, storage, etc. of this material to an outlet where it might be consumed as a combustible fuel or where it may be utilized in a chemical or digester system for the production of a gaseous energy product. There have been limited studies on this in regard to feasibility and cost.

In regard to animal waste, the most likely process, other than returning the material to the land as a fertilizer source, is the production of methane gas. Although small units have operated in Asia and under some conditions in Europe, no units have really operated under the cold climate conditions in Canada. While it appears that the most effective use would be in heating, it is quite evident that when heating requirements are the greatest, such units operate very inefficiently utilizing more than half of the energy produced to maintain the process in operation.

Therefore, storage and other aspects of technology must be developed beyond the simple digestion process of producing the gas. The process is somewhat dangerous to "play around with" from an asphyxiation and explosion aspect of the process. Present costs appear to be two to five times the cost of the energy being replaced.

A different alternative use for some of the animal waste, particularly poultry, which would replace an indirect energy input into agriculture, is the recycling as "pop" pasteurized organic protein through ruminant animals as a high energy supplement in their feed. There is also the possibility of developing methanol, a liquid hydrocarbon from animal waste, or ethyl alcohol from wheat (at $5.00 a bushel?) as a supplement in gasoline. It is evident that up to 25 percent of these products can be satisfactorily mixed with gasoline and used in present spark ignition motors without any bad effects. However, as far as Western Canada is concerned with perhaps 80 percent of tractors having diesel motors, this will not be helpful.

There are recent developments in wind power equipment which is more efficient than the regular windmills, but with electricity available almost 100 percent on Canadian farms, it is not likely there will be much use of this type of equipment.

Solar energy developments will not have any significant impact on energy replacements in agricultural production unless it is through improved photosynthesis in plants or in greenhouse-type production.

Methods of Energy Conservation

Under the pressure of increased fuel costs and a national objective of conservation, energy saving methods will be practised in farming operations. However, the amount of energy saved may be a small proportion of the total useage. By necessity, agricultural production on the farm has always been efficient, including use of energy; there is little opportunity to reduce consumption in large amounts, such as might be attained by reducing the weight of automobiles to under 3000 lbs. each.

Many conservation practises that can be recommended for the farm will also affect the food supply, and judgements may have to be made as to whether food can be traded off for energy. For example, conservation measures may increase efficiency but reduce the quantity of product output (reduced use of fertilizers, increased use of forages in crop rotations to fight weeds), and may save energy but reduce the quality of the product (weathering damage to grain left in the field longer, instead of harvesting earlier and using artificial heat for drying).

Energy conservation methods will be aimed at conserving all types of fuels. Besides gasoline, diesel and gas, the farm is also a consumer of electricity and lubricants. In addition, machinery, building supplies, fertilizers, and farm inputs such as these also consume energy in their manufacture and distribution to the farm.

Conservation methods can be outlined under the three main categories detailed below. Some other additional savings will be made as a result of non-agricultural conservation programs, such as reducing energy use in the home, or building more efficient engines. Conservation methods, and some examples of each include:

(a) Avoid direct losses or waste of energy.

- cool, protected fuel storages reduce evaporation losses.

- more insulation and sealing, storm doors and double windows reduce heat losses from heated buildings.

- more frequent tune ups and maintenance procedures on engines and machinery reduced fuel useage.

- proper tire inflation and removal of wheel weights when not needed reduces energy required to move vehicles.

- sharp, properly adjusted cutting surfaces reduce energy requirements for cutting and processing crops and materials.

- engines, appliances, and heating units turned off when not needed reduce waste of fuel.

- eliminate unnecessary travel, hauling, or movement of products to save fuel.

- use waste products, such as manure for fertilizer.

(b) Improve efficiency of operations in terms of energy use.

- use machines that can perform similar jobs with less power, such as a chisel plow rather than a moldboard plow, augerless rather than auger type bunk feeders, or roller rather than hammer mills.

- operate equipment at efficient levels, such as properly matched loads and tractor, lower speeds for blowers and tillage operations, or reduced depths of tillage.

- choose equipment that utilizes more efficient energy sources, such as electric motors rather than internal combustion engines, or diesel rather than gasoline engines.

- choose practices that use less energy, such as crop rotation and tillage rather than herbicides, or minimum tillage rather than traditional tillage methods.

- substitute labor for mechanical work.

(c) Eliminate or reduce energy consuming activities.

- discontinue operations such as crop drying, sprinkler irrigation, or snow clearing.

- reduce levels of operation, such as lowering temperatures in heated buildings, reducing lighting levels, or using less fertilizer.

- make fewer purchases of new equipment and materials.

In summary, agricultural production requires a large input of energy which at present is utilized quite efficiently. The greatest portion of the energy input is in the indirect form over which the farmer has little control except in his judgement to use or not to use. A significant increase in food production will require additional quantities of energy.

Alternative sources of energy are not readily available in a useable, practical or economically feasible form. They warrant further technological development in light of higher cost and potential scarcity of present fuel. Conservation methods in energy use will be made which, although individually small in themselves, can affect reductions in overall energy use.

DESIGNED FOODS

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"Designed foods" or as they are sometimes called "Fabricated foods" are manufactured foods that contain a significant amount of separated "component" as contrasted with the traditional whole commodity. The agricultural commodity is processed into components which are then modified to produce food ingredients with specific desirable attributes. The major components are proteins, carbohydrates and lipids which have desirable functional properties that allow them to serve as binders, emulsifiers, thickeners, stabilizers, gelling agents, extenders, whipping agents, nutrients, flavors, etc. "Designed foods" occur in many classes including baked goods, meat products, snacks, baby foods, pet foods, pasta products, desserts, puddings, soups, beverages, breakfast cereals and so on. Many designed foods are also "convenience foods".

Recent years have seen an increasingly rapid change in our life style, and in food technology. One definition of "traditional food" is "food we ate as children". Todays' new "designed food" is tomorrows' traditional food, provided it is accepted by todays' children.

This past summer, spurred on by the increased price of meats, hamburgers with one-quarter to one-third of their meat protein replaced by soy protein extenders came onto the market. The stimulation of traditional foods with less expensive alternative components will become more widespread as the cost of living increases and as component technology improves. However, there is another aspect to consider. We enjoy a very high standard of living wherein food and food service takes less than one-fifth of the average Canadians' expendible income. This affluence allows consumers to indulge themselves, so it is unlikely that such luxury items as meats for the gourmet trade, for example, will be displaced by substitutes or extenders. It is probable however, that new designed foods will satisfy consumers' criteria for acceptability sufficiently well that lower price will not automatically equate with lower quality in the mind of the consumer. This is to say, designed foods can be prestige foods!

One of the major changes occurring in our life style is the rapid increase in institutional and food service meals at the expense of home prepared meals. Designed foods usually find favor in the first instance, away from home. Many consumers will try new foods in restaurants that they would not consider preparing at home. Designed foods are capturing an ever increasing share of the food market. It has been estimated they will make up about 8 percent of the total North American food sales by 1980.

A problem that requires careful attention is the nutritional status of designed foods. When the designed food is an extender of, or a substitute for, a traditional food it clearly must maintain the nutritional status of the traditional food. When the designed food is a new concept food the situation is more complicated. The role the food will play in the total diet may not be readily apparent. There may, in fact, be a place for "zero nutrient" foods, for example as diet foods or as snacks and between meal tid-bits for the obese. In any event, nutritional status is likely to be one of the constraints on designed food developments. As an example, it is technically possible to make a synthetic milk that looks and tastes like real milk. It is extremely difficult, however, to incorporate the same quantity of nutrients that occur naturally in milk. Milk is so important in the Canadian diet that it is unlikely the Health Protection Branch of the Department of National Health and Welfare will approve a milk substitute that is not nutritionally equal to milk. It is not likely that we will see an acceptable synthetic milk in the near future. By contrast, coffee whiteners, and whipped toppings are substitutes for dairy products that are not so important in nutrition and are therefore accepted on the basis of their other functional properties.

The challenge for Canadian agriculture in designed foods is to gain a fair share of home and foreign markets for ingredients. We must ensure that the technology is developed so Canadian commodities can enter into competition with foreign commodities as raw material for component production. If we fail to do so, we will continue to export our surplus commodities and import expensive specialized food components and thus fail to make the maximum contribution to the Canadian economy. The P.O.S. facility in Saskatoon is an important step in the right direction. It is, however, only a step. A great deal of research and development at the food technology level is needed to ensure that competitive technology is developed and used to the advantage of our economy.

Stated in bare outline, the requirements for a "components" industry are as follows:

1. A source of raw material. We are very fortunate in Canada to have sufficient production of cereals, legumes and oilseeds for raw material. We should be able to compete well with such imported raw materials as rice, cassava, soybean, peanuts, etc.

2. Processing plants. Capital investment in facilities and equipment is required. Perhaps our tendency to have a branch plant "psychology" is a hang-up here.

3. Technology. This can best be provided through research and development. We are seriously short of technologists and research facilities in the Canadian food industry.

4. Marketing expertise. This is particularly critical if overseas markets are to be sought. Fortunately, the Department of Industry, Trade and Commerce is willing and able to provide assistance and advice.

Where do we stand with respect to the major food components in Canada? If we are to capitalize on the shift to designed foods we must sell designed food ingredients both at home and abroad. In Canada, at the present time, imports of processed agricultural materials exceeds exports by a substantial amount. This reflects the fact that we export wheat, rapeseed etc. and import corn starch, soy protein, coconut oil, etc. It goes without saying that the optimum strategy in trade is to sell the maximum amount of "added value" that is economically possible.

Edible oils - We export much more than we import if we consider oilseeds as oil. We import a large quantity of soybeans and export a much larger quantity of rapeseed. In recent years we have exported a substantial quantity of soybean oil while utilizing the meal for animal feed. We import a substantial amount of special oils such as coconut oil and cocoa butter for food ingredient purposes. It is not likely that we will become self-sufficient in specialized oils, but our net trade should remain favorable.

There is need for research on the nutritional deficiencies of Canadian oils and on their chemical stability. We need to improve our technology on the utilization of Canadian oils in competition with imported oils.

Carbohydrates - This is a large class of components covering both starch and sugar products. We import much of our sucrose and we import a substantial amount of starch and starch derivatives such as dextrin and dextrose. We import about one-fifth of our total needs and nearly all of the expensive specialty starch products having "tailor made" qualities.

Starch surpluses are likely to be a problem for Canadian agriculture if we develop a component technology in proteins from legumes or cereals. New technologies are being developed for converting starch to sugar. These should be exploited and Canadian industry encouraged to supply the Canadian market and compete for foreign markets. We need a great deal of research on new uses for starch and starch products.

Proteins - This is the most important class of food ingredients because protein is the most critical factor in world nutrition. In addition, proteins play an important role in texture (chewiness, firmness, etc.) and consistency of many foods. It is predicted that the use of vegetable proteins in human food will sky rocket in the next few years.

Canada has been a net exporter of protein, primarily as a result of exporting surplus skim milk powder. In order to maintain self-sufficiency in butter we produce a much larger quantity of skim milk than we consume.

Most of our trade in other edible proteins is relatively small except that we are importing an increasing amount of textured soy protein as meat extenders and meat substitutes. We have need to develop the technology for competitive products of Canadian origin. The P.O.S. plant at Saskatoon will help.

Increasingly as time goes on, single cell proteins of non-agricultural origin will move into the food chain. At present, substantial experimentation is underway overseas on the feeding of livestock with yeasts and bacteria grown on hydrocarbons. If the economics of such operations prove favorable an increasing amount of livestock feeds will be produced in this way. It is quite conceivable that single cell protein will become the starting point for protein ingredients in designed foods for human consumption. Such a development is, however, still several years away.

Another potential development area is the extraction of protein from green leaves where yields per acre can be very high. I expect we will see a concerted effort to develop protein technology that will allow us to select and modify proteins with specific functional properties for specific food uses. The food development technologist of the future will have a wide range of functional proteins to choose from.

One of the feed-backs of the shift to trade in components for designed foods will be some pressure to price commodities on the basis of component content and value. The process is beginning with wheat protein. In the future, milk will be purchased on the component basis and oilseeds are a logical candidate for component pricing. Increasingly, as time goes on, the farmer will feel the effects of this type of pricing.

The quantity of designed foods will increase steadily both in domestic and foreign trade. Canada is in a good position to compete in these markets with ingredients from cereals and oilseeds. We will continue to be dependent on imports for plantation food products and many highly specialized food components. Our success with designed foods will depend in large measure on research and development. If we compete successfully, Canadian agriculture and the Canadian economy will benefit.

WHEAT OUTLOOK

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Outlook 1973-74

World exports of wheat during 1973-74 are expected to be 4 to 5 percent lower than during 1972-73. Exports are expected to be between 64.0 M.M.T. and 64.9 M.M.T. compared with 67.5 M.M.T. in 1972-73. The main decline in trading will be in exports to the U.S.S.R. where the net decline is estimated at 9.5 million tons. In terms of the world market, part of this decline will be offset by increased requirements in China, Africa and Asia.

The world's largest exporter of wheat will again be the United States. Sales and commitments by the U.S. indicate exports for 1973-74 of at least 31.3 M.M.T., just 3 percent less than last year's exports.

Exports from the E.E.C. could be higher than last year's 6.3 M.M.T. Australia's exports are likely to exceed 6.0 M.M.T., slightly more than last year. Argentina's net exports are likely to be about 1.5 M.M.T., down from those of last year.

Although there has been an increase in wheat production, the situation remains fairly tight and world stocks will be at very low levels at crop-year end. It appears likely that prices will remain about current levels, but the low level of supplies in the main exporting countries makes price prediction more hazardous than usual. One factor that may have a dampening effect on world food grain prices is the record world rice crop of more than 300 million tons, an increase of 7 percent from that of 1972. Rice stocks have been low and prices at record levels in recent months. The very low stocks of both wheat and rice suggests that any price declines will be small.

Since Canadian supplies are 120 million bushels (3.3 M.M.T.) less than in 1972-73 it will be impossible to maintain the export and domestic use level of last year without a further stock reduction; a reduction is expected. Total exports could approach 500 million bushels (13.6 M.M.T.). However, internal transportation difficulties and possible external transportation problems arising from the world energy problems could prevent the realization of this export level.

Outlook 1974-75

It appears probable, because of the relatively strong world prices and the fear of world scarcity of food grains, which have led to an international focus on food needs, that efforts will be made by many

countries in 1974 to increase wheat production. The strong prices will be an inducement not only to exporters but also to importers, particularly to the developing countries where foreign exchange reserves have been under pressure. Attempts will undoubtedly be made to increase rice production as well.

There are only a few indications of planting intentions for wheat in 1974. In the United States, winter wheat acreage is 18 percent (eight million acres) more than last year. The United States wheat crop in 1974 may be about 54.5 M.M.T. (2,000 million bushels) compared with 47.0 M.M.T. (1,711 million bushels) in 1973.

In Canada, there is likely to be an increase in wheat planting, perhaps as much as three million or more acres to be about 28 million acres. Such a wheat acreage appears to be in keeping with expected export demand, domestic requirements and the relatively low level of stocks.

If world production in 1974 reaches record levels there could be some weakening of prices. Record level wheat production could result in some rebuilding of stocks of both ordinary wheat and durum, but it will take more than one year of record production for stocks to return to what might be termed normal levels. Wheat prices are unlikely to drop to the levels of two years ago.

Over the next few years, world wheat production may be in excess of commercial demand. However, the experience of last year, when a poor wheat crop occurred in one large producing country at the same time as there was a poor world rice crop, could be repeated in any year, causing renewed price fluctuations similar to those of recent months. Other factors to be borne in mind are the increasing requirements for wheat, which has been estimated at about 250 million bushels a year in recent years, and the increasing competition for crop land from other grains and oilseeds. In addition, it must be recognized that with the elimination of the United States set aside acreage, the main exporters do not have much additional land available for wheat production except by transfer from other crops. Of major uncertainty is the degree of self-sufficiency likely to be attained by countries where production fluctuations have been greatest, including the U.S.S.R. and China, and developing countries such as India and other Asian and African countries.

WHEAT — IMPLICATIONS AND ALTERNATIVES

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The situation paper states that world wheat production is at record levels, trade is close to the 1972 peak, prices are at their highest levels in history, and stocks are extremely low. This would suggest that the outlook for wheat is at least as good as it was last year when we agreed that it was the "best in years". The outlook paper suggests that production will go even higher in 1974, trade will be a bit lower, stocks should increase, and prices could soften somewhat.

The outlook is based on the assumption that record prices and concerns over shortages of grain supplies will provide the necessary incentives to raise world production above the recent record levels. It also assumes that the market will act in a traditional manner and adjust downwards provided more supplies come forward. There are many variables that could disrupt the forecast. I think the two most important ones are farmers' reaction and the weather. Farmers in most countries are facing an entirely new situation in which demand for all crops is strong and prices are attractive. They are also facing unusual pressures on farm supplies and exceptional cost increases with respect to fuel. Furthermore, the markets are extremely sensitive and prices are virtually unpredictable. Incomes are high and grain inventories are low. I believe seeded acreage will increase in most countries, but I am not sure that farmers the world over will plant as much additional land as some forecasts predict. They may tend to build up inventories and this would require additional seeded acreage if similar market volumes are to be retained. We all realize that the weather may not co-operate and that crop failures somewhere in the world are a distinct possibility. The market is so tight and sensitive that any significant change will trigger a movement in one direction or another.

It is also evident that importers are facing a new situation. On the one hand high prices are having a rationing effect, but this is at least balanced by a tendency for deficit areas to protect themselves by securing ample supplies, if possible. Importers are likely to carry stocks at higher levels than has been the case traditionally unless it is their judgment that prices will decline significantly. For the time being, importers appear very nervous and are emphasizing security of supply over prices.

What are the implications of the outlook? If you examine the situation globally, you would conclude that importers and exporters alike will emphasize the need to increase production. The USSR has already achieved

notable success and while they may continue to buy some grain it will be at levels below the last crop year unless, of course, the weather turns against them. Western Europe has been maximizing production for some time and will probably achieve further gains, but weather is a determining factor. At this time it appears that China, parts of Africa and Asia will maintain imports at least at recent levels. Demand in the Middle East, the Indian Subcontinent and South America looks stronger than normal. There will also be a tendency for importers and exporters to re-build their inventories if supplies permit.

Among the exporters, the United States expects next year's crop to reach two billion bushels, 300 million above 1973. Their stocks are the lowest since 1948, and they expect to export less next year and to add to stocks. The current Australian crop is well up on last year, but lower than anticipated due to rust. Argentinian plantings are down due largely to heavy rain. Argentina is almost certain to increase seeded acreage considerably in 1974 and the other exporters will also endeavour to do so.

Therefore, I cannot quarrel with the prediction that production is likely to increase except to emphasize that the weather may not co-operate and that uncertainty on the part of farmers over costs and the stability of markets may dampen their reaction. Many elements of the market are exceptional, and hence, producer and buyer response is even less predictable than in most years.

Turning to Canada, I can see no reason why wheat production should not increase to the maximum level suggested for last year of 28 million acres. It may go beyond that level. If farmers decide to increase their wheat acreage and are successful in producing an extra 100 million bushels or more, they will face, I believe, two broad possibilities. Should world production expand as is anticipated and markets soften somewhat they should be able to sell the additional production at good prices, assuming that the greater tonnage can be moved. Farmers may elect to carry some of it over. If the weather does not co-operate on a global basis, Canadian farmers can almost certainly bank on a strong, continuing market and possibly higher prices. Marketings, as in the case this year, may depend more on our ability to transport grain. If the markets are softer in 1974-75, farmers may elect to carry some of their 1974 crop forward. If so, they may decide that a balance should be maintained in cropping and inventory programs. In other words, farmers might agree that an expansion in wheat acreage should not be at the expense of the acreage devoted to oilseeds, feed grains and other crops, but rather should be taken out of the total area devoted to summerfallow. This suggestion is supported by current readings of the continuing strength of feed grain and protein markets over a period of years.

The outlook has implications for grain companies and agri-business generally. Unusual developments on the farm supply and cost side, which have occurred to date, and the likelihood that the cost pressures will increase, due to shortages generally and higher fuel costs in particular, will encourage farmers to implement cost-saving measures. There should be opportunities to provide farm inputs and technical assistance which contribute to more

intensive production, and assist farmers in improving their net incomes. The favourable income position at present offers the opportunity not only to farmers to place their operations on a more favourable basis for the longer term but also for agri-business to assist them to do so. I think everyone agrees that our grain handling and transportation system needs change, and that there is scope for improving business support for agriculture. Changes and improvements cost money, but this may be the best opportunity to invest in the future.

There are also implications for governments. Last year I stated that an immediate challenge facing the industry was to maximize the movement of grain - that challenge is there but is even more urgent today. Governments can encourage improvements in the system in a number of ways, but the initiative for change should also come from the companies and organizations directly involved. Another challenge for governments relates to the problem of uncertainty facing farmers. In this respect, new policies are being formulated and the Federal Government is taking the initiative. I am referring to proposals for grain market stabilization or insurance, the extension of price guarantees and advance payments for certain crops, and improved storage policies. Governments can also assist in maintaining a strong marketing system. Again, considerable initiative is being taken. The feed grain policy is designed to assist Canadians to exploit the expanding feed grain and livestock markets in a manner which provides equal opportunity to all regions. We are also continuing our market development and credit programs and doing our best to maintain our position abroad for barley, feed wheat, rapeseed, and their products, as well as for milling wheat. A new emphasis is being placed on the need to further process our own grains and oilseeds - the proposed Protein, Oilseeds and Starch Pilot Plant at Saskatoon is a concrete example of this emphasis.

ALTERNATIVES

Last year, in examining alternatives, I noted that producers had a range of alternatives for the first time in a number of years. I suggested that Canadian farmers should take advantage of the strong wheat market, but since swings in the market are likely to re-occur should also gear up to remain in the oilseed and feed grain markets and to work for a strong livestock industry. Frankly, I do not see the alternatives as being much different this year than they appeared one year ago.

On the surface, the economics of wheat growing look favourable in comparison to most other crops in the Prairie area. Again, while farmers have many alternatives open to them, it seems obvious that they should take advantage of the strong wheat market. The key question once again is whether the expansion in acreage should be at the expenses of other crops or be taken out of total summerfallow. Obviously, each farmer will reach his own decision and the industry could raise wheat production significantly while reducing the acreage devoted to other crops. That would be unfortunate. Another alternative would be to maintain the acreage planted to barley, rapeseed and other special crops, and expand wheat acreage significantly while reducing summerfallow by equal amounts. I would recommend the second alternative because I believe it provides important balance to the farm sector and the

best hedge with respect to the future. If markets remain strong, it should be possible to sell whatever is grown and at good prices. We can expect fluctuating markets in the future and most observers believe that markets for milling wheat will adjust more rapidly than for feed grain and protein crops since the latter enjoy a stronger continuing demand. Farmers may elect to carry more grain forward as security for the future. I believe that the security would be greater if the carryover were in the form of feed grain and oilseeds in addition to wheat.

I also think it is important that the farm sector and the industry as a whole continue its efforts to diversify. I am thinking not only of feed grains, including feed wheat, but of rapeseed, other oilseeds and high protein cereals and pulses. We should also use the present situation to place our production units on a sound basis, to improve and extend our handling and transportation systems, to negotiate better long-term access to markets, and to add value to the crops grown through processing. Diversification has benefitted Canadian farmers in the past and it should do so in the future.

FEED GRAINS OUTLOOK

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Before starting the Outlook there are some changes in world figures received since the situation was presented which really relates to outlook. U.S.D.A. FAO bulletin of December 14 indicates world feed grain production 2 percent higher than earlier estimates. Stocks were not down as much as earlier estimates, but world consumption was quite a bit higher. On balance, it appears that world supplies could be higher than world requirements, but by only a very small margin and not enough to change the world outlook. Further revisions in figures of course will still occur for several months since even last year's figures are still described as "preliminary".

It is of interest to note that the FAO annual report just received has feed grain production figures somewhat different from those of the U.S.D.A. For example, world corn production figures for 1972 are estimated by U.S.D.A. at 284-285 million tons, but FAO estimates them at 301 million. I am not suggesting that one figure is right and the other wrong, but that estimates of feed grain production on a global basis are hard to make, although trends are probably clear enough.

Another point of some interest in the last few days was a late estimate of the 1973 U.S. corn crop, down from the previous estimate by 35 million bushels to 5,643 million bushels.

World exports of feed grains are estimated at 66 million metric tons compared with 63.6 million last year, and sharply higher than any previous year. The main increasing exporting countries will be the United States, Argentina and Thailand. Countries expected to increase imports include Japan, West Europe and the People's Republic of China.

With supplies of Canadian barley down by 45-50 million bushels, it is unlikely that last year's export level of 165 million bushels will be met this year. Exports could reach 150 million bushels with some reduction in stocks from last year's levels. Furthermore, there are indications that some reduction in feeding may occur, particularly for hogs, over the rest of the crop year which would reduce domestic barley disappearance to less than 350 million bushels compared with an estimated 356 million in 1972-73.

Prices of Canadian feed grains will continue a fairly close relationship with United States corn, although prices of barley in some cases have been higher than equivalent U.S. corn prices. U.S. corn futures are strong through next July with supplies considered tight. Feed

grain prices will remain firm until new supplies are in sight at which time prices will begin to be influenced by the supply-demand prospects for the coming year, both for feed grains and protein meals. More uncertainties with price implications for the coming months are in evidence than usual, including the possible impact from the energy crisis and possibilities of further changes in values of world currencies.

OUTLOOK 1974-75

Carryover stocks in the hands of major world exporters are all likely to be low at July 31, 1974, and in total to be at the lowest level in 15 years. Any further increase in consumption will depend on the level of world production in 1974. The United States expects to plant an additional eight million acres in feed grains in 1974 with an estimate of production 10 percent above the 1973 record output. If growing conditions are good, the U.S. could have the highest supplies on record despite lower carryin stocks. Many other countries will be trying to increase feed grain supplies in order to increase or at least maintain livestock production. If expected world feed grain output materializes, there could be some reduction in imports and lower prices would result.

The expanding domestic markets for barley together with the export markets which have been developed and the low stock position of feed grains suggest the desirability of 13 million or more acres for barley in 1974. We would anticipate that plantings of barley will reach at least 12 million acres, the same as last year. Oat acreage could also be little changed. A small increase in corn acreage is probable, particularly in Ontario and Quebec. Those areas of Canada which have been dependant on western grain will likely make some effort to expand production due to the high prices this year.

Feed grain prices are likely to continue relatively strong into the 1974-75 crop year, although probably not as strong as in 1973-74 if the expected increase in U.S. supplies is realized. This would influence Canadian prices even if Canada is in a continued fairly short supply position.

Over the next few years expansion of feed grains in Canada will depend on price relationships with wheat and other crops. World demand for feed grains has been growing at a steady rate and will continue to expand. Therefore, producers who decide to continue with barley production can expect to benefit from consistent growth in the world feed grain market. It appears likely that over time the world demand for livestock will bring about a more favorable price relationship for feed grains and lead to expansion in production.

Outlook (Additional remarks)

Since this was written, we have available a new planting intentions figure in the United States and also a January 1 stock figure released on January 25. Stocks for all feed grains are lower than last January 1, except sorghum. The reduction in stocks of all feed grains is 7 percent or about

11 million tons. If yields are no higher than the rather low yields of last year, corn production on the expected acreage could produce an extra 14.3 million tons. Barley production, on the other hand, on acreage reduced from 10.9 to 9.3 million acres could have a production decrease of 1.5 million tons. Oats down slightly and sorghum up slightly would almost cancel out. Feed grain production increases in total could be up by 12.8 million tons so that total supplies would be up from last year by less than two million tons.

Feed grain production in the U.S. seems in total likely to increase substantially, but indications seem to point to a somewhat lower level than expected earlier with wheat probably getting a larger share than expected of the total crop land increase.

Crop Acreages 1971 and 1972 and Indicated Acreages for 1973 and 1974 Prairie Provinces
Superficies de récolte 1971, 1972 et 1973 et superficies indiquées pour 1974
Provinces des Prairies

	1971	1972	1973	1974	
	- million acres - milliers d'acres				
				Probable	Indicated by market expectations -- Indiquées par des expectations du marché
Fallow - en jachère (en repos)	26.0	29.0	25.5	21.5	18.0
Wheat - blé	18.9	20.8	24.2	28.0	28.0
Oats - avoine	5.3	4.6	5.3	5.0	5.0
Barley - orge	13.3	11.9	11.35	11.5	13.0
Rye - seigle	0.9	0.6	.6	.6	.6
Mixed grains - grains mélangés	0.9	0.96	.9	.9	.9
Flax - graine de lin	1.8	1.4	1.45	2.0	2.0
Rapeseed - graine de colza	5.3	3.3	3.15	3-3.25	4.5-5.0
Tame hay & pasture - foins et pâturage	11.4	12.4	12.15	13.0	13.5
Miscellaneous - divers	0.7	1.0	1.0	1.0	1.0
Total	84.5	86.0	86.2	86.5	86.5

II Eastern Canada - Canada de l'Est

Crop acreage indicated 1973 and 1974 - Superficies de récolte indiquées en 1973 et 1974

	1973	1974
	- thousand acres - milliers d'acres	
Wheat - blé	445	490
Barley - orge	438	465
Oats - avoine	1,328	1,375
Rye - seigle	50	50
Mixed Grains - grains mélangés	1,089	1,075
Corn - mais - grains	1,270	1,350
Soybeans - soya	470	475
Total	5,090	5,280

FEED GRAINS
— IMPLICATIONS AND ALTERNATIVES

H.D. Pound
Chief Commissioner
Canadian Grain Commission

Well, at least this is a year when you can talk about the outlook implications for feed grains and have no trouble filling twenty minutes of time.

The world is undergoing an energy crisis, a monetary crisis, a population growth crisis, and in Western Canada, we have a farm income tax crisis. About the only other crisis - excepting possibly this paper - that doesn't seem to influence the Commodity market at this time is the pollution crisis!

A crisis can carry you for a great many minutes in an analysis. For instance, I noticed in the last semi-annual issue of "Oil World" that both a bullish and bearish influence on oilseed prices was seen in the same piece of evidence dealing with the energy shortage. Bullish on prices because shipping costs would go up due to higher oil prices. Bearish on prices because the reduced shipments of oil would create more competition for grain shipments and lower shipping costs.

Yet, as much as we can kid about economist or analysts taking the two-handed approach - "On one hand this can happen, but on the other hand this can happen" - the approach is needed. Both points of view must be presented: Why the market is going to do what it's going to do, and the other side of the story. This certainly applies to feed grains when we talk about prices, because corn is king and corn is priced on the futures market. "Open Interest" on the corn market is always evenly matched - so any time someone promotes either a bullish <u>or</u> a bearish analysis, the position is theoretically contrary to the view of half the people with positions in the futures market. Similarly, a bullish <u>or</u> bearish price is contrary to a great number of farmers who do the opposite to what your forecast or implications suggest.

Now that I'm properly hedged, I'll look at Mr. Carmichael's situation and outlook and pass on the views of traders and other people I talked to.

<u>Comments on Situation and Outlook</u>

Some of my comments are quite minor, and some argue with a few of the premises.

First, the situation. Some of the figures are different from what I find in the "World Agriculture Situation and World Grain Summary", December 15.

In the summary, world production of feed grain should be 593 instead of 582, making it 48 million tons or 9 percent above the revised 1972-73 production and 33 million tons above the record production of two years ago.

In the first paragraph of the situation report, after the summary, world feed grain production for 1973-74 should be 48 rather than 37 million metric tons more than last year, and the increase in consumption should be 30 million rather than 18 million tons. Beginning stocks were down by 12 million, not 18-19 million as indicated. The last sentence in the first paragraph should read "feed grain" rather than "feed" production in the last few years. Also, I think a reference should be made in that sentence to the fact that, not only has feed grain production not been in keeping with demand, but also demand has been so strong feed grain stocks have dropped.

As far as the world corn production in 1973 goes, we have figures that can be more precise than "appears likely to be well above last year's." The estimated world corn production in 1973 is 309 million metric tons. The 1972 world corn production figure is 285, not 284, (11.230 million bushels, not 11.180 million bushels).

On Page 3 of the situation report, first paragraph, I think the figures for international trade in feed grains this crop year are expected to be 6 percent, not 3 percent higher than in 1972-73. The 1972-73 figure was 61.8 million metric tons, rather than 62.6 million metric tons.

Other points brought out concerning the situation section are more general in nature.

The second paragraph on Page 3 points out that prices of feed grains are heavily related to export prices of corn. Other factors also are important. World prices are, at times, related to levies imposed on imports into the EEC.

On Page 4, concerning malting barley, I think the important point is that the trade feels malting barley usage this year will be down considerably. Canadian pricing policy and high price structure may reduce demand for Canadian barley. Canadian malting houses are experiencing pricing problems in export channels as well.

Further, American maltsters and breweries have cut back on their usage of 2-Row varieties in their malt blends because of the higher premiums over 6-Row varieties. The big end of Canada's exports to the U.S. over the past several years has been 2-Row barley. But since August 1, 1973, we are down considerably on 2-Row barley shipments to the U.S.

Turning to the outlook section. First of all, the traders I talked to felt it should be stressed that demand has increased primarily because of expanding world population and a more affluent society demanding to eat more meat.

During 1973-74, it was felt that domestic corn usage in Eastern Canada will show a significantly higher percentage of use than the tone of the outlook for 1973-74 indicates. The price of low-grade wheat from Western Canada is high and is being replaced to a large extent by corn. Also, corn is replacing barley to some extent.

People in the trade feel that the impact of corn vs. barley competition was not stated strongly enough. It was felt that basis the present market, U.S. corn on a tonnage basis is slightly cheaper than Canadian barley and will - if the present price levels hold - replace some barley, particularly in the Eastern market. Prices of protein supplements are an important factor when comparing feeding costs.

It was also pointed out, concerning the price relationship of corn and barley, that the close relationship would not necessarily hold true - where Board barley is based on the non-Board market in the prairies and the prairie non-Board market is not necessarily closely related to corn.

Incidentally, I think you can safely say that U.S. corn futures are strong through next September, rather than stopping at July.

Considering the 1974-75 outlook, a number of observations were made by the trade.

First, there was general agreement with the comments expressed on U.S. feed grains. Domestic usage and projected exports will be well over production, resulting in much lower carryover figures. Acreage forecasts, however, on corn are higher for next year, with an indicated reduction in barley. The January 21 USDA crop report, based on intentions to plant in the 35 major producing states, and applied to the whole U.S., shows these acreage estimates for 1974:

- Corn up to 77,440 million acres compared to 70,393 in 1973, a 10 percent increase;

- Sorghum up to 19,562 million from 19,303 million, a 1.3 percent increase;

- Barley down to 9,281 million from 10,943 million, a 16.2 percent drop;

- Oats down to 18,769 million from 18,986 million, a 1.1 percent drop.

But I think the forecast of the U.S. producing the "highest supplies on record" should be hedged with "presuming that herbicides, fertilizer and fuel supplies are adequate, not to mention weather."

In summary, really what's happened is that some of the increase in U.S. corn and wheat acreage appears to be at the expense of barley and oats.

It was mentioned in the 1974-75 outlook that the Canadian oat acreage could be little changed from last year. I wonder. The price relationship between oats and barley doesn't look attractive. Is the price relationship the Western farmer is looking at accurate? If so, will people continue to grow as much in 1974 as they did in 1973?

Incidentally, "the expanding domestic markets for barley" does not sit too well with some people and it is suggested that "barley" will be replaced by "feed wheat and corn". One reason for this suggested change is that it was stated earlier that there is going to be a decrease in barley use during the current crop year.

The conclusion in the 1974-75 outlook that "world demand for feed grains has been growing at a steady rate and will continue to expand" was not accepted by all people in the trade. Some felt that this conclusion assumes a strong demand and ability to pay for meat. Said one, "Unless the world economic situation improves soon, there could be considerable world unemployment and a decreased demand for many of the higher-priced foods such as meat."

All in all though, Mr. Carmichael's forecast for 1974-75 seemed to be fairly well accepted. Of course, a few people mentioned that, given a big flood in the Yellow River or a drought in the USSR, Mr. Carmichael might as well start over again.

Implications of the Outlook

The implications section is the tough one, from the way the Outlook Conference is structured, since really we should have access to the outlooks for all grains in order to do a better assessment. In the case of feed grains, we would also do better if we had access to the outlook for meat production since we're talking about feed grains, not food grains, and the economic merits of filling an animal's gut is actually the main question.

First, I think a few general remarks are needed in order to fit barley into some of the crises I referred to earlier. Some points brought out by people in the trade are:

First: The recent price increases for agricultural and primary commodities are a result of the sharp expansion of money supply in the world. For the last twenty years, the quantity of money in the world has more than tripled, while the prices of primary commodities stayed stable.

It can be argued that the increased standard of living for the great mass of the populations in developed countries like the U.S., Japan and Western Europe was achieved on the backs of the producers of primary commodities.

Second: For the time being, this process of stable primary commodity prices in the face of substantial money inflation has been reversed. Whether this reversal will prove permanent will depend on a number of factors, and will differ for different primary commodities.

Third: The major factors determining the prices of primary commodities are development of demand and development of production.

Fourth: Recent history has indicated that while the good grain, feed grain and oilseed markets in the world are inter-related, the supply and demand factors in each of these markets are separate and distinct. Consequently, the price development of each of these markets can be autonomous to a large extent.

Since wheat is both a food and a feed grain, some general comments should be made about wheat, as seen by the trade, before turning to a few general remarks about the world feed grain market.

First, the world market for wheat as a food grain requires an increased supply of somewhere between seven and 10 million tons each year to satisfy the increased world population and slightly improve nutritional standards. A part of this increased supply is also needed since it now seems hard to increase rice production, after the increases in this production during the "green revolution" of the 1960's.

Second, a further development last year was the 2 percent increase in the use of wheat for human consumption in the developed world, despite the high price of wheat. This was probably due to the high price of meat in these countries, but marked the first such consumption increase in the last 20 years.

Third, stocks of wheat outside the USSR will probably decline during the 1973-74 crop year by seven to eight million tons, and will reach almost irreducible levels by the end of this crop year. This means that wheat production during 1974 on past performance would have to increase by 14 to 18 million tons to keep stocks even at the very low levels of this year.

Fourth, achievement of such a production increase seems problematical, but there are two reasons why such an increase may not be necessary:

- Some developing countries may not have the foreign exchange next crop year to buy their requirements of wheat due to the sharply increased prices of mineral oil and other essential products;

- The developed world uses about 20 million tons of wheat for feed each year. If the current price difference between wheat and corn continues during next summer, up to eight million tons of wheat normally used for feed could be freed for human consumption.

Now let's take an overview look at the feed grains market, as seen by the traders I talked to, and by Mr. Carmichael:

First, the feed grain market in recent years has required an increased supply of 18 to 22 million tons each year to satisfy the demand largely in the developed world.

Second, while wheat for human consumption is milled directly and sold to consumers, feed grains have to be converted into animal feeds before reaching the meat consumers. Consequently, it usually takes between nine and 12 months before changes in consumer attitudes towards meats is reflected in feed grain demand and prices. It is probable that, during recent months in a number of countries in the developed world, the expansion of meat consumption has decreased below the trend of the last few years, or that meat consumption has even declined. This will probably not be reflected in feed grain demand and prices until next summer.

Third, oilseeds have one leg in the feed market (Meal) and the other in direct human consumption (Oil). This can mean that, under certain circumstances, oilseeds will adjust to consumer attitudes before feed grains. In this respect, oilseeds are tied closer to feed grains than to wheat, which in many cases is an essential staple of the human diet. Yet the individual's consumption of meat and oil can be reduced without harm.

Considering the implications in Mr. Carmichael's outlook and what it means to farmers, I come to these conclusions:

1. I doubt if farmers in 1974 will seed even the 11.3 million acres seeded in 1973. Wheat prices are simply too good and regardless of how we want to look at it, a great deal of farmer decision-making about what to seed is based on what happened in the past. If an acre of wheat has produced about one-third more income than an acre of barley, this will be a big bargaining point in favour of wheat.

We only have to look at the U.S. January 21 intentions-to-seed report where wheat and corn, particularly wheat, increased in acreage, and barley acreage dropped. The same story seems likely here.

2. The early April report of what Canadian farmers plan to seed, based on a survey in late March, will be especially important for farmers to watch this year. In past years, it has been a remarkably close prediction of what farmers actually do seed. In other words, farmers have been very rigid in their production decisions. For the man who is willing to change, however, an enormous wheat acreage exceeding 30 million acres with a low barley acreage should point to the merits of seeding more barley. Short quotas on wheat could be a definite possibility that would make barley look better in the 1974-75 sales years.

3. An acreage of around 10 million acres of barley should strengthen prices more than those suggested in the outlook report. The chance to sell 1974 barley on the non-Board market and aim for a high-price-at-a-risk, rather than take a Board group price at no risk, might interest some farmers.

4. Barley will be affected more than wheat by any fertilizer shortage or high fertilizer prices. Barley does not do as well as wheat if fertility is poor, and keep in mind that a much greater percentage of barley is seeded to stubble, which needs more fertilizer, than wheat.

5. Big price swings or all crops seem inevitable. Farmers selling to the Board, of course, will be subject to a pooled price and not realize these swings. Growers of oilseeds and non-Board feed grains sold domestically should develop a consistent sales policy, either through hedging part of their crop, or selling so much each month, or selling at certain target prices.

6. The steadying factor in barley acreage, regardless of price and sales outlook, is the livestock industry. Cattle and hog prices appear to have good prospects for the balance of this year and this will ensure a fixed amount of barley is grown. After all, well over half this country's barley is fed on the farms where it is grown.

For implications on people other than farmers concerning the feed grain outlook, I really do not see that many.

A low acreage of barley will tend to prevent "surplus" hog and beef feeding and certainly there appears to be little incentive for a man to feed livestock simply to convert his grain to meat. In fact, the move might continue to be the other way. This will mean a loss in business to meat packers; less low meat prices to consumers; and less barley handling (though possibly taken up by extra wheat handling) for elevator companies.

Malting companies claimed they lost a considerable amount of business on the export market this year because Board prices were out of line with their U.S. competitors. A smaller barley crop promises to continue that trend.

A low barley crop will, of course, be influenced by corn prices regardless of the size of the barley crop, but at least it is a bullish price factor.

That is the way I see the feed grain production and market in Canada today. Producers and agribusiness should watch for swings in specific commodities that could develop at any time during the crop year.

OILSEEDS OUTLOOK

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As a result of the expected large increase in world oilseed production, 1973-74 will be a year of rebuilding of world oilseed stocks, particularly in the United States where soybean stocks are expected to jump to 260 million bushels. World protein meal consumption from January to September was estimated by Oil World at 3 percent below the 1972 level. Consumption in the fourth quarter of 1973 was 1 percent below the 1972 level. Demand will likely continue to increase slowly in the first quarter of 1974. In addition, meal users may be reluctant to secure future supplies at current prices. Vegetable oil users may also be reluctant to secure future supplies although soybean oil futures do indicate oil will be cheaper later in the crop year. Prices of oils and meals are likely to decline from current levels, although the declines will probably be quite moderate until near the end of the crop year when Brazilian soybeans begin to enter world markets. Oilseed prices may decline more sharply than oil or meal prices, particularly if soybean marketings in the United States accelerate sharply. Prices of oilseeds, oils and meals will likely continue to experience a considerable degree of instability until stock levels have been rebuilt to more normal levels.

Because of reduced supplies, exports of Canadian rapeseed will likely be reduced in 1973-74 to about 42 million bushels. With recent expansion in capacity, domestic crushing is expected to increase to 19 million bushels, leaving a six million bushel carryover at the end of 1973-74. Because farmers this year are marketing their crops relatively early at high prices, this year's average farm price will easily exceed last year's estimated price of $3.20 per bushel.[1/] Despite smaller domestic rapeseed supplies, rapeseed prices will likely decline somewhat from current levels in response to larger international oilseed supplies.

Although the rate of soybean crushing in Canada is likely to increase, the total 1973-74 crush will be lower than in 1972-73, and will probably not exceed 20 million bushels (22.3). The probable results are that soybean imports will decline and use of rapeseed and imported oils will increase to make up for the reduction in soybean oil production. Soybean prices are likely to decline in 1974, particularly if the rate of marketings in the United States is sharply increased. However, the weighted average Chatham price is expected to be sharply above last year's level of $4.30 per bushel.

[1/] This was estimated by Agriculture Canada using weekly average street prices and weekly marketings of rapeseed.

Domestic demand for sunflowerseed oil is expected to continue strong for the balance of the crop year. Despite the sharp reduction in sunflowerseed production, domestic crushing is expected to record a small increase. However, exports are expected to be reduced sharply.

Flaxseed production in the three major exporting countries (Canada, United States and Argentina) is now expected to increase by less than 3 million bushels. Furthermore, combined stocks of seed and oil are down by 35 million bushels (seed equivalent) giving total supplies of 65.7 million bushels (98.9), down 33% from 1972-73. A small quantity of linseed oil could be available from the larger 1973-74 crop in India. However, even if this should reach the equivalent of 3 million bushels, the tight supply situation will be only marginally changed. Because of tight world flaxseed supplies world prices are likely to remain strong throughout the rest of 1973-74. The result of the U.S.D.A. planting intentions survey indicating that as of January 1, 1974, farmers in the United States do not intend to increase flaxseed acreage, will tend to give added support to flaxseed prices.

Because of reduced supplies, both domestic processing and export of flaxseed are likely to be lower in 1973-74. Exports will probably be reduced to 17 million bushels while domestic crushing will likely fall to 1.5 million bushels leaving a four million bushel carryover at the end of the crop year. Prices will likely remain strong throughout the rest of the crop year although some decline may occur if meal prices fall sharply.

OUTLOOK 1974-75

World carryover stocks of oilseeds beginning in 1974-75 are expected to be much higher than for 1973-74, particularly in the United States. However, the 1974-75 increase in oilseed production is not likely to match the record increase of 1973-74. Prices in 1974-75 are expected to begin the crop year at lower levels than in 1973-74. World flaxseed production is likely to increase substantially in 1974-75. However, as stocks will be very low, a fairly large increase can be absorbed in rebuilding stock levels. Although flaxseed prices in 1974-75 are unlikely to be as high as for 1973-74, nevertheless, they will remain relatively high for the 1974-75 crop year.

Canadian rapeseed stocks at the beginning of 1974-75 will be sharply lower than 1973-74 despite the sharp reduction in exports which is expected. However, prices will likely be somewhat lower in 1974-75, reflecting larger world oilseed supplies. In view of the very low stock levels an increase in rapeseed acreage to about 4.5 million acres would appear warranted although current indications are that little, if any, increase will be forthcoming. Farmers planning to grow high erusic varieties of rapeseed should seek a contract for such production.

Despite the expected sharp increase in the carryover of soybeans in the United States, soybean prices are expected to be quite favorable in

1974-75, though not as high as 1973-74. Reduced soybean production in the United States is expected to contribute to favorable prices.

Demand for sunflowerseed, both for domestic and export, is expected to grow in 1974-75. However, should the U.S.S.R. decide to export sunflowerseed oil as a result of their sharply increased sunflowerseed crop, the high premium being paid for sunflowerseed oil could be reduced quite substantially.

Flaxseed stocks at the beginning of 1974-75 are expected to be very low while prices and world demand are expected to continue strong. An increase in flaxseed plantings to 2.0 million acres in 1974 would appear warranted. In view of current and expected strong flaxseed prices, this acreage may well be achieved.

OILSEEDS — IMPLICATIONS AND ALTERNATIVES

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Winnipeg

The major oilseed crops produced in Canada reached their highest price levels in history during the last month of the 1972-73 crop year. During the first month of the 1973-74 crop year, prices far surpassed those levels. A major drop in rapeseed and flax prices took place during harvest, but since then prices have recovered to near their highest points of last August. This past Wednesday rapeseed in Vancouver reached a price of $8.65 per bushel while the next day flax hit $12.42 per bushel. While rapeseed and flax prices weakened during the latter part of last week, one wonders whether it is possible that the high points have yet been reached this year.

For farmers, there is a critical decision. Should they sell now at fantastic price levels or should they hold on longer for possible even higher prices? Thus far, less than half of the flax and rapeseed has been marketed. Of that which has been delivered, not all will have been sold. I find it difficult to develop an answer for the farmers' problem with respect to time to sell his crop from the Outlook which has been presented.

Perhaps it is unreasonable to expect the Annual Outlook to provide information of this type. However, I believe the Outlook should give at least some guidance for the current year as to expected prices. Information that "this year's average farm price is likely to exceed last year's estimated price of $3.20 per bushel" is not very useful; not when the lowest farm price since the start of the crop year was over one dollar per bushel higher than this price and when the farm price has at times been about $4.00 per bushel higher. It is an extremely difficult if not impossible task to predict commodity prices. However, there are underlying forces which dictate whether prices will rise or fall. I do not think the Oilseed Outlook adequately examines these underpinnings of Canadian oilseed price determination.

Very little is stated about the supply of competitive oilseeds produced in other countries except for U.S. soybeans. For example, what is the outlook for palm oil production next year? What are the characteristics of world oilseed demand? How fast is the consumption of edible oils growing and can one expect this growth to continue? What is the relevance of currency re-alignments for the level of oilseed prices?

In 1973 there must have been some basic changes in the factors determining oilseed prices, aside from the Peruvian fishing problems. Last year, for example, it was stated that for flax, "Prices at Thunder Bay should average $3.25 per bushel or more".

If my memory serves me correct, I believe flax prices never once got this low at any time after the Outlook in November, but in fact rose very rapidly soon thereafter, and reached over $12.00 per bushel a few days after the end of the crop year. If we can mis-guess last year's price by such a wide margin, what confidence can we have that this year's estimates will be any more reliable, particularly when no explanation is given for the wide discrepancies last year.

What then are the implications of this oilseed Outlook for Canadian agriculture? It states that flax prices in 1974-75 will be "strong". Nothing is said directly with respect to rapeseed prices for the next crop year. However, by implication one might assume that the statement "Prices in 1974-75 are expected to begin the crop year at lower levels than in 1973-74" applies to rapeseed as well as other edible oilseeds and that lower prices are projected.

What do these price projections means for rapeseed and flax production in Canada? Probably not very much. Firstly, I doubt if farmers will be utilizing this Outlook information very extensively in formulating their 1974 cropping plans. This is not necessarily to discredit the Oilseed Outlook. Other more current price projection information may become available before production plans are finalized. However, more importantly, many other factors than absolute price levels for oilseeds will determine how many acres are planted this spring.

All crop prices are high at the present time relative to past levels. It is the relative returns amongst crops which will determine how many acres of flax and rapeseed are produced. However, relative returns are not easily determined. At seeding time expectations of prices can perhaps be formulated, and based on expected yields, expected relative returns determined. However, for different crops there will be different degrees of uncertainty and risk associated with the projection of returns for each different crop. This uncertainty does not arise just because of price, but also because of production uncertainty.

Farmers are not necessarily irrational by shifting production away from crops with high yield risk towards those with lower risk when the expected margin between receipt and expenditures gives a high level of income. I don't believe farmers will shift to wheat at times of high prices and unrestricted delivery opportunities just because "they like to grow wheat". In addition to risk factors, many farmers find that their costs per acre increase as the number of different crops produced is expanded. The time and bother to clean and re-adjust equipment is a strong deterrent to a multiplicity of crops for many farmers.

I believe the underlying factors at seeding time this spring will be such that rapeseed acreage will decrease from last year's level and that flax acreage will be similar to last year.

While rapeseed and flax prices have already reached very high levels this year, the average realized price by many producers will be such that the gross or net returns realized from oilseed crops will be very similar to

those for wheat and perhaps feed grains once the added production risk is considered. Many farmers will probably expect the same situation to hold next year. Therefore, together with greater yield risk the "bother factor" and greater cost of growing a multiplicity of crops, many will cut out altogether, one or both of these oilseed crops.

Such an outcome would be unfortunate for the long term future of rapeseed production in Canada. During the current year, exports of rapeseed must be curtailed to allow available supplies to meet total needs. This past August we started the crop year with a carryover of 20.1 million bushels. Next year the starting inventory will be considerably less, probably about six million bushels and therefore a smaller production would mean considerable reduced disposition for 1974-75.

However, I do believe that in the absence of any unforeseen events, rapeseed acreage will decline next year. Disease and insect problems for this crop have become of increasing concern for farmers. Also many became disenchanted with the yields from the low erusic acid varieties relative to the previous varieties. Fertilizer shortages will also be a negative factor for rapeseed production as stubble seeded crop requires considerable added nitrogen.

There are a number of plus factors for rapeseed production in 1974. However, it is my judgment that these considerations will be overshadowed and a decline in acreage will take place. Firstly, not all producers have liked the variable nature of rapeseed prices. The pooling concept which Mr. Lang promised for next year (1974-75) will encourage some producers to increase rapeseed production. At the same time those who prefer the open market approach will not be deterred.

Of prime importance is the cash flow associated with both rapeseed and flax. Even though the demand and price situation for wheat and barley is outstanding, this is not yet being reflected at the producer level because of low initial prices compared to expected final prices. For some farmers, it is rapeseed and flax which have been paying the bills for the entire farm.

A further advantage to oilseed production including sunflowers is that some part of the present high price level can be guaranteed for 1974-75 through contracting. In the case of flax and rapeseed, hedging on the Winnipeg Commodity Exchange is another way of achieving a price guarantee.

During this past week flax prices for next fall's delivery could be guaranteed at between $9.50 and $10.00 per bushel. Rapeseed prices could be locked in about $6.00 per bushel for next fall. Using 1973 Prairie average rapeseed yields of 16.9 bushels per acre, at $6.10 per bushel this would mean a gross of over $103 per acre. To achieve the same gross, wheat prices would have to average (based on 1973 yields) over $4.00 per bushel next year. While this could be quite possible, this general returns level can not be guaranteed in the same way with wheat since there is no way of being sure that $4.00 per bushel will be realized next year.

A further advantage to rapeseed is that even with a somewhat expanded acreage next year, it is more than likely the open quotas will be achieved. If wheat acreage in Canada expands significantly, it is quite possible that open quotas will not develop in 1974-75.

If a farmer seeded rapeseed and under-assigned his rapeseed crop for quota purposes, he could enhance his ability to sell wheat.

Finally, rapeseed varieties licenced last year and commercially available in 1974 do have higher yield potential than the earlier LEAR (Low Erusic Acid Rape) varieties.

I have predicted that flax acreage in 1974 will not differ significantly from 1973. This projection is based on primarily the same factors as for rapeseed. However, disease potential could be more important for flax next year than for rapeseed. There is considerable concern that the flax rust strain 370 could become widespread in the Prairies next year. The resistant varieties Linott and Raja are in extremely short supply.

If a farmer seeded both rapeseed and wheat, but indicated less than his actual rapeseed acreage and more than his actual wheat acreage for quota purposes, he could enhance his ability to sell wheat.

There are early indications in the United States that flax acreage will not expand next year even though prices are high. The January 1st intentions report indicates a slight reduction for 1974 compared to 1973. The reasons that American farmers are not increasing flax are probably not that much different than for Canadian farmers.

Should flax acreage not increase in North America next year, the price could become much higher relative to other crops.

While a fertilizer shortage could compound the problems of rapeseed production, it could lead to greater flax acreage. Flax can produce relatively good yields with lower nitrogen applications than cereal grains. At the same time flax requires no phosphate fertilizer.

A shortfall in flax production next year is not likely to be as serious as a shortage of Canadian rapeseed. The market for flax is relatively stable for traditional uses and is a well established market. On the other hand rapeseed consumption is growing considerably. Canada is developing a strong export market for rapeseed. The development of this market could be seriously damaged if insufficient supplies are available next year.

I believe it is in the interest of the entire agricultural industry in Canada to ensure that rapeseed production is maintained.

One means would be to provide more complete information to producers about some of the advantages of its production relative to cereal grains - for example, quota prospects, possibilities for freezing present price levels, etc.

Perhaps, however, a more direct approach to achieving greater rapeseed production is necessary. I doubt if it is realistic to consider transfer payments from the Federal government. However, other direct means are available. For example, why not have the Canadian Wheat Board declare unequivocally that there will be no quotas on rapeseed in 1974-75. Thus producers who grew rapeseed could, for quota purposes, assign these acres to other crops. This could be a relatively powerful incentive to growing more rapeseed. It would be a costless approach. It is doubtful that it would lead to undue elevator congestion.

Other means of encouraging rapeseed production would be to increase the level of coverage under the crop insurance programs. In this way a producer would receive a much better guarantee of recovering his costs of production than he would for other crops. It might not be essential that the governments pay the extra cost of insurance coverage.

In summary, the Oilseed Outlook has projected lower edible oilseed prices in 1974-75. At the same time, however, it is suggested that flaxseed prices "are expected to continue strong". However, one should not lose sight of the fact that all agricultural product prices are extremely high relative to historical levels. Because of high levels of farm income associated with crop production, farmers' production response in 1974 may be entirely unpredictable.

BEEF OUTLOOK

F.E. Payne, Director
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Current Situation

Cattle slaughter in North America in 1973 was lower, and followed a very irregular pattern, compared to 1972. For the year 1973, Canada's federally inspected slaughter, at 2,878 thousand head, was virtually unchanged from the previous year. In the U.S., however, federally inspected slaughter in 1973 totalled about 30.5 million head, a decrease of about 5.5 percent from the 1972 level. In both countries, the decreases in cattle slaughter in 1973 were in contrast to recent annual increases.

While Canada's federally inspected cattle slaughter in 1973 was virtually unchanged from a year earlier, "slaughter of domestic origin" - that is, federally inspected slaughter less live imports of U.S. slaughter cattle - was down 5.2 percent from the corresponding figure for 1972. This 5.2 percent decrease was the result of a 2.2 percent decline in the West and a 10 percent decline in the East.

The main reasons for the reduction in Canada's slaughter of cattle of domestic origin in 1973 were: for the period October-December 1972, exports of feeder cattle from Canada to the U.S. reached a relatively higher level of nearly 45,000 head; and for the year 1973, feeder cattle exports to the U.S. increased to 128,167 head, compared with 52,084 head in 1972. Gains in feedlots have been slowed in 1973, both as a result of strong feed prices, and the banning of the hormone "DES" on January 1, 1973. Furthermore, Canada's female cattle slaughter declined in 1973. In addition, some cattle may have been held back from market due to very uncertain market conditions.

In both Canada and the U.S., fed cattle prices in 1973 increased sharply, averaging at record levels (Figure 3). However, market disruptions and uncertainties resulted in wide variations throughout the year. The price of A1, A2 steers at Toronto in 1973 averaged $46.56 per cwt and Choice steers at Omaha averaged about $44.60 per cwt. In both cases this was an increase of over $8 per cwt from 1972. In both countries, fed cattle prices reached unusually high levels in August, with A1, A2 steers at Toronto averaging $57.06 and Choice steers at Omaha $53.61 per cwt. The expected price increase after the U.S. price ceiling on beef was lifted September 9, 1973 did not appear. In contrast, prices declined sharply.

United States Outlook

In the U.S. total cattle inventory continues to increase, with total

cattle and calves on farms and ranches at January 1, 1973, numbering 122 million head; an increase of four million head, or 4 percent from a year earlier. According to the U.S.D.A.[1], U.S. cattle inventory growth at January 1, 1974 could double last year's considerable (4 percent) expansion, with all of the increase in beef cows and young beef animals.

Fed cattle slaughter in the U.S. in 1974 is expected to exceed 1973 levels. According to the U.S.D.A., on December 18, 1973, "fed cattle marketings next year could exceed 1973 marketings by a fairly sizeable margin, but would be only a little above 1972 marketings".

The U.S.D.A. expects fed cattle marketings in the first half of 1974 will average above January-June 1973 levels, with all of the increase in the spring. On balance, fed cattle marketings this winter could be down perhaps 4-6 percent from a year ago. Second quarter marketings could be up 7-9 percent from a year ago, and 6-8 percent above winter shipments".

Since the U.S.D.A. Outlook Conference, however, the U.S.D.A. January 1, 1974 report on cattle and calves on feed has been released. The report shows a 6 percent decrease from a year ago in total cattle and calves on feed in 23 major feeding states. The 23 states report an increase from year-earlier levels in the heavy weight ranges, but this is outweighed by a decrease in the number of lighter cattle and calves on feed. The information contained in this report does suggest that fed cattle marketings in the U.S. could be heavier in the winter and lighter in the spring than was previously indicated.

According to the U.S.D.A., fed cattle prices during the first half of 1974 are expected to strengthen in the winter months, and then weaken through spring. Choice steers at Omaha this winter may average around "$44 to $46", compared to $43 a year earlier. (For the week ended January 19, 1974, Choice steers at Omaha averaged about $48.00 per cwt).

U.S.D.A. earlier price predictions may be tempered somewhat by the forthcoming supply situation indicated in the January 1 cattle and calves on feed report. If production in the spring is much lower than previously predicted, prices could average well above the $41 to $43 range this spring.

Price prospects for the second half of 1974 appear quite unsettled. The U.S.D.A. states, "Continued larger output in the second half would sustain downward pressure on prices".

Canadian Outlook

Total cattle and calves on farms in Canada at June 1, 1973 numbered a record 14,051 thousand head, up 2.9 percent, or 395 thousand head, from a year earlier. This increase continues the steady upward trend in Canada's

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[1] Outlook for Livestock and Meats; Talk by John Larsen at the 1974 National Agricultural Outlook Conference, Washington, D.C., December 18, 1973.

cattle population since 1969. At June 1, 1974, Canada's cattle inventory may be expected to again show an increase - possibly 3 to 5 percent from June 1, 1973.

Canada's federally inspected cattle slaughter in 1974 can be expected to average above 1973 levels. However, the level of slaughter during 1974 may be influenced at times by the level of imports of U.S. slaughter cattle, and the export of cattle to the U.S. for feeding and slaughter.

The June 1, 1973 cattle survey by Statistics Canada showed continued expansion in feeder cattle availability. Calves on farms numbered 4,033,800 head, up 232,200 head, or 6 percent, from June 1, 1972. The increase in calf numbers was primarily in Western Canada. A continued reduction in calf slaughter in 1973 may also contribute to increased 1974 cattle slaughter.

The level of Canada's exports of live cattle and calves - both recently and in the near future - will be a factor influencing 1974 cattle slaughter. A higher than year-earlier level of live exports in January-September, 1973 may have some downward influence on early 1974 marketings. However, the sharply lower level of feeder cattle exports to the U.S. in the fourth quarter of 1973 will contribute to the expected increase in 1974 marketings over 1973 levels.

Increased female slaughter is expected in Canada in 1974. This reflects rapid herd expansion since 1969, a lower level of feeder heifer exports to the U.S. in the fall of 1973, and the fact that cow slaughter has continued through 1973 at very low levels in relation to the number of cows on farms.

While an increased supply of young beef animals in Canada and the U.S. provides the potential for increased marketings in both countries in 1974, both the extent and the timing of increased marketings may continue to be influenced by the feed grain situation, the full impact of the banning of "DES", and market conditions. In addition, the behavior of the feedlot operator in both Canada and the U.S. may be influenced by the adverse profit situation feeders have experienced on cattle sold this past fall and winter that had been purchased at high feeder prices earlier in 1973 and fed at the relatively higher feed grain prices that have recently prevailed.

Fed cattle prices in Canada during 1973 were on a full import basis from September to year end. For the months of November and December, 1973, A1, A2 steers at Toronto averaged $46.90 and $46.51 per cwt. respectively, both over $7.00 above the price of choice steers at Omaha. The fact that Toronto prices were above Omaha prices mainly reflects fed cattle prices being on an import basis. In addition, the increased magnitude of this price spread in November-December was due to the surtax imposed by Canada on beef imports. For the week ended January 19, 1974, A1, A2 steers at Toronto averaged $54.00 per cwt. compared with $42.65 for the same week of 1973.

Fed cattle prices in Canada in 1974 will continue to be basically influenced by the trends in fed cattle prices in the U.S. The precise relationships between Canadian and U.S. prices will reflect whether Canada remains at a

full import basis or moves to an export basis or somewhere in between. This will basically depend on Canada's forthcoming fed cattle slaughter and consumer beef demand.

On balance, the price of A1, A2 steers at Toronto during the first half of 1974 can be expected to average above the price of Choice steers at Omaha, which is predicted by the U.S.D.A. to average $44 to $46 in the first quarter and $41 to $43 in the second quarter. An expected larger year-to-year increase in beef supply in the U.S. than in Canada, along with continuing strong consumer demand for beef in Canada, point to a price at Toronto which may be high enough at times to attract some imports of live slaughter cattle from the U.S. While some movement of slaughter cattle from the U.S. into Canada may be expected in 1974, both the level and timing of any importation is difficult to predict.

Cattle feeding profits, at least through the first part of 1974, are expected to reflect relatively higher feeder cattle and feed grain prices. Feedlot operators since mid-summer have been affected by a much more negative price margin, particularly since September. In addition, feed grain prices have continued at relatively higher levels, resulting in unfavorable profit conditions for feedlot operators in the fall and early winter of 1973.

Longer-Term Trends

In recent years, the growth in the demand for beef has been the dominant factor in generating higher beef cattle prices, providing the basic incentive to producers in both Canada and the U.S. for herd expansion.

In both countries, the rise in beef prices occurred even though supplies per person were rising to record levels. In 1972, Canada's per capita beef consumption rose to 92.5 pounds compared with 86.9 pounds in 1971. Also, in the U.S., consumption of beef per person rose to 116 pounds in 1972 compared with 113 pounds in 1971.

During 1973, cattle slaughter and beef consumption in North America was greatly disrupted. However, the longer-term trend in beef output and beef consumption can be expected to be upward in both Canada and the United States.

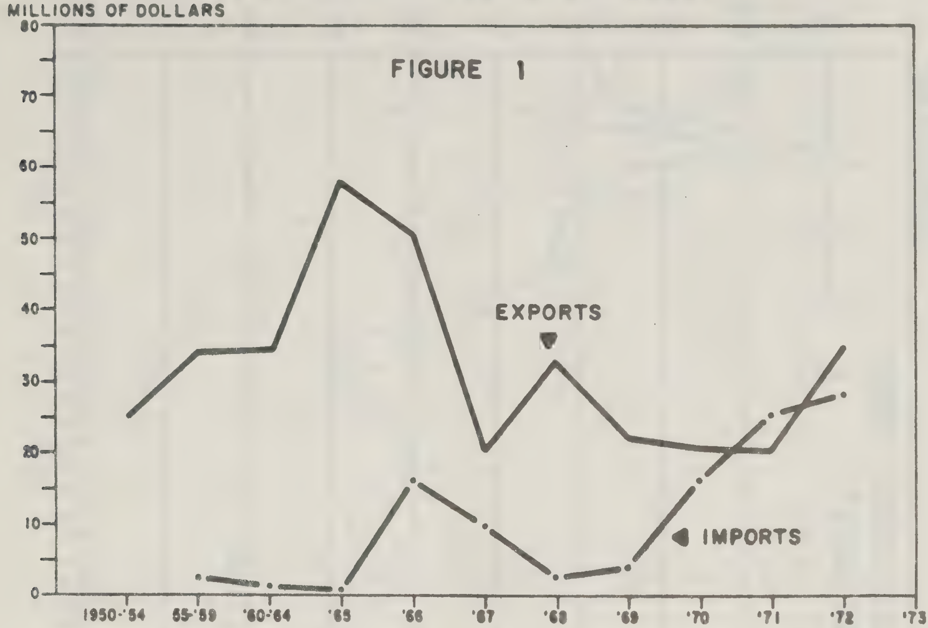
The North American cattle cycle is currently experiencing an upward phase in total cattle numbers, which became pronounced commencing in 1969. Somewhat in line with past cycles, cattle slaughter since 1969 has shown relatively little year-to-year increase, as beef females have been held back from slaughter while herds have been building up. However, the recent year-to-year increases in slaughter have been less than expected.

The North American beef industry operates on an increasingly worldwide beef economy. In many major beef producing countries, the ups and downs in beef output and prices are following increasingly similar patterns. It is pertinent to point out that recent events in the beef industry have

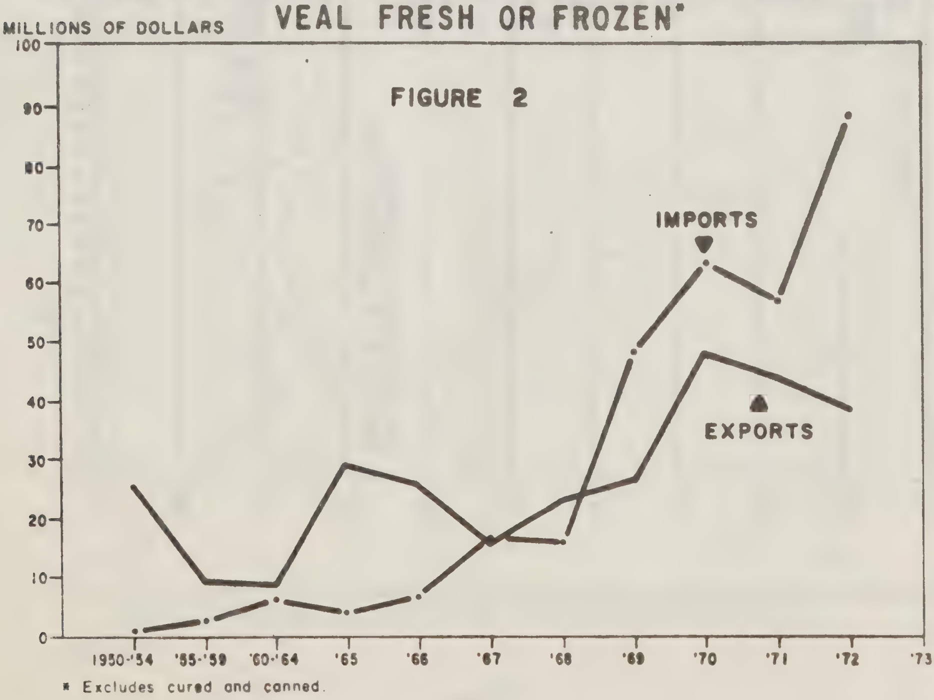
been felt both in major importing areas - North America and Europe, and major exporting nations - Argentina and Australia. In all of these areas, herds are gradually being built up in response to the rise in beef prices.

In view of the many new elements only entering the total beef production and profit equation, it can well be anticipated that the future will bring many changes and readjustments to this industry. Rising feed grain and fuel costs will have an impact on our traditional grain-fed beef industry and if consumers are not prepared to pay the cost of this type of table beef it may, over the longer term, decrease in availability. Speculation is already evolving as to the possible economics of more animals being finished as grass-fed beef. This would lengthen the feeding time considerably and put additional pressures on grassland currently supporting cow-calf enterprises. Whatever the final outcome, it will be the final profit situation that will influence the nature of our national beef industry of the future.

CANADA: TOTAL EXPORTS AND IMPORTS OF LIVE ANIMALS FOR BEEF AND VEAL PURPOSES

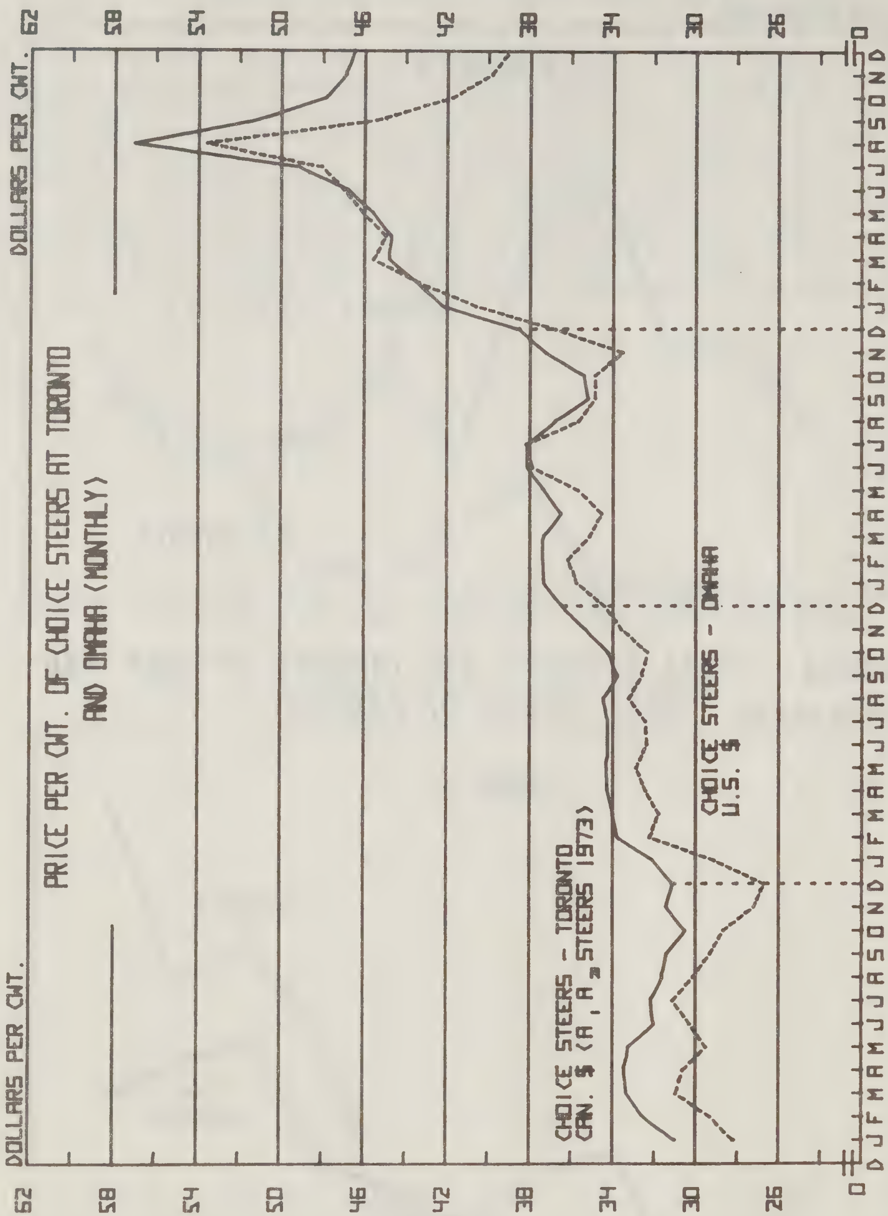


CANADA: TOTAL EXPORTS AND IMPORTS OF BEEF AND VEAL FRESH OR FROZEN*



* Excludes cured and canned.

FIGURE 3


PRICE PER CWT. OF CHOICE STEERS AT TORONTO
AND OMAHA (MONTHLY)
DOLLARS PER CWT.
DOLLARS PER CWT.
CHOICE STEERS - TORONTO
CAN. $ (A1 A2 STEERS 1973)
CHOICE STEERS - OMAHA
U.S. $
62
58
54
50
46
42
38
34
30
26
0
D J F M A M J J A S O N D
1970
1971
1972
1973

CATTLE AND CALVES ON FARMS, 1950 - 73

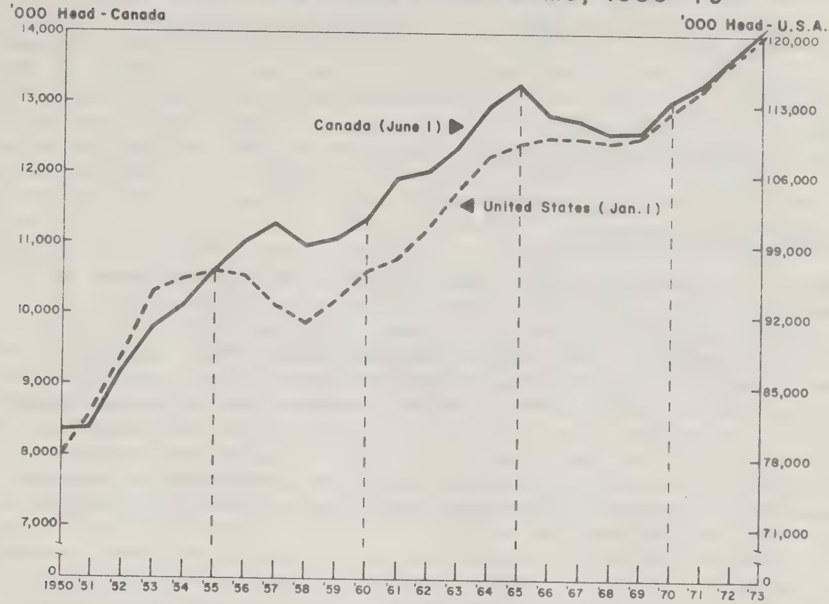


FIGURE 4

COMMERCIAL CATTLE SLAUGHTER IN CANADA - UNITED STATES 1950 TO 1973

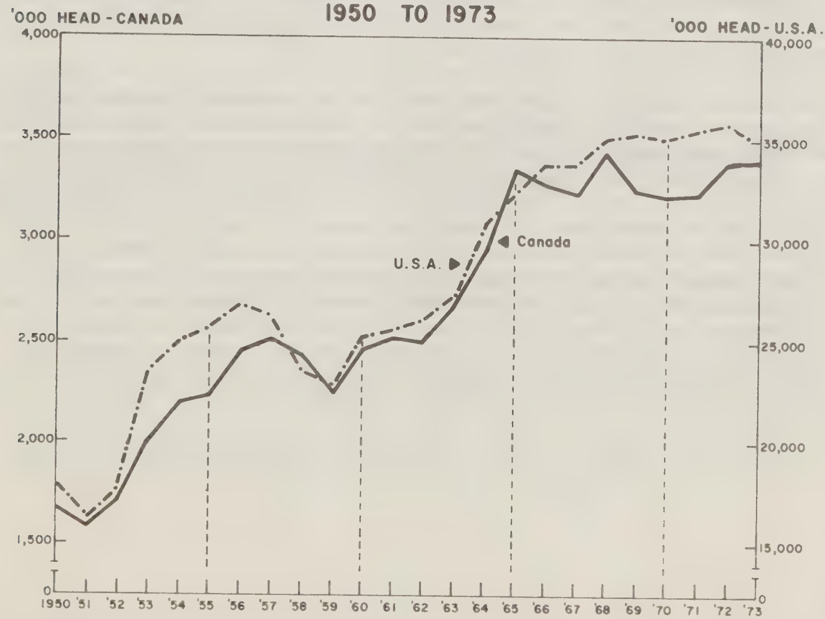


FIGURE 5

BEEF — IMPLICATIONS AND ALTERNATIVES

C.A. Gracey
Manager
Canadian Cattlemen's Association

General Reaction to Outlook

In general, I am in substantial agreement with what appears to be a well documented and realistic outlook. This outlook marks the first time that the Federal Government has been paid enough attention to the rate of expansion in Canada's national beef herd. Expansion has been going on in Canada since 1969 and in the U.S.A. since 1970. The observation that expansion may have already surpassed optimum levels is no longer premature. The outlook also acknowledges that record calvings will occur in the spring of 1974 with present prospects of equal or even substantially heavier calvings in 1975. Thus, continued increases in a) fed cattle marketings and b) cow marketings through at least 1977 are ordained.

The outlook also recognizes another important nuance of the beef cycle, not generally recognized, but fundamentally important. I refer to the observation that the rapid expansion since 1969 has temporarily reduced the total supply of beef. Some observers note that herd expansion in recent years is not resulting in parallel increases in the beef supply. In fact, it is if one has regard for the composition of the slaughter and for the necessary lag between increases in the beef herd and resultant increases in fed slaughter.

Often in recent months, it has been tempting to conclude, on the basis of the number of imported slaughter cattle, that domestic supplies of fed beef were inadequate. However, whereas market prices during much of the last quarter often failed to return to the cattle feeder his costs of production, one could argue conclusively that supplies exceeded demand at a price level that allowed the producer a modest profit. One must understand that the consumer, conditioned to react adversely to price rises, might define "adequacy of supply" somewhat differently than a producer who is striving to show a profit. Therefore, with costs of production rising inexorably, with cattle prices fluctuating up and down, and with the prospect of continually increasing supplies, it is easy to agree that cattle feeders may continue to face a relatively profitable position in 1974.

One can agree with the outlook that the only certainty for 1974 is a continuation of the present atmosphere of uncertainty. The basis of the uncertainty that will plague us throughout the year will be the question of pattern of marketings. To summarize the situation, we know that record numbers of cattle and calves are on farms and ranches in both Canada and the U.S.A., but we don't know in what pattern these cattle will flow into feedlots, how they will be fed (whether rapidly or slowly) in feedlots, and in what patterns they will be marketed. All we know for sure is that they are there. One American estimate, for example, claims that there are 3.7 million more beef calves and yearlings that haven't moved into feedlots than was the case one year ago. As this represents a 21 percent increase over 1972, the increase may be regarded as significant and all but guarantees sharply increased marketings before the end of 1974.

I must take issue with just one remark in the outlook paper, which is the claim that there is "An expected larger year to year increase in beef supply in the U.S. than in Canada...points to a price at Toronto which may be high enough to attract some imports of live slaughter cattle from the U.S.A.".

I agree with the statement, but for an entirely different reason than was written. Fundamentally, we should expect larger year to year increases, on a percentage basis, in Canadian beef production than in American beef production. This is so because the Canadian beef cow herd has grown at almost double the annual rate of the American herd since 1969. However, if the above quoted prediction comes to pass, it will not be the result of a relatively more rapid growth in the breeding herd, but the direct result of the exportation of large numbers of feeder cattle from western Canada to the U.S.A.

Implications and Alternatives

In recognition of the growth of the breeding herd, and of the prospects for ever increasing supplies of fed cattle through 1977, the first implication would appear obvious. And that first implication is, "A retreat from present or planned arbitrary governmental measures or incentives designed to stimulate further expansion in the beef breeding herd".

This is not a plea for a contraction of the breeding herd, but rather a case for consolidation while the industry gets its bearings. The evidence is clear that supplies will be abundant if not burdensome. In fact, it is my view that supplies may be adequate throughout 1974 to;

a) fully supply anticipated domestic needs,

b) export significant numbers of feeder cattle to the U.S.A., and

c) have sufficient residual supplies to test and service emerging markets.

Many may feel that the argument for consolidation is an excessively conservative view, but the idea of consolidating the national herd at its present level would leave the industry poised to advance boldly into emerging markets, when and if the opportunity arises. Consolidation is also much preferred over rapid attrition because, should excessive cow marketings develop (i.e. over 15 percent of F.I. slaughter), this cow beef, in combination with continuing heavy importation of Oceanic beef, could trigger an excessive price erosion. A higher rate of cow kill is now inevitable in view of the protracted period when cows were held back for "one more calf". However, we have noted before that a national herd buildup never stops when we have "just enough cows". Expansion invariably continues until the cowman discovers that because of plentiful calves the price offered doesn't return a sufficient profit. Then cows are sold off in excess numbers, and hence, the beef cycle. The trick of achieving consolidation followed by orderly growth must rely upon information. For that reason, this exercise is worthwhile.

While it is accurate to note that;

a) Canada has become part of a world beef economy, and

b) events in the Canadian market are of little significance on a world scale;

it is, nevertheless, folly to conclude that continued rapid expansion in Canadian beef production can bring more benefit than harm. In the first instance, this is true only to the extent that we can exploit export opportunities. Much is said about soaring world demand for beef; and by all means, we should exploit such opportunities and may be considered tardy as a nation for not yet having done so. Fundamentally, however, we must also recognize that at least the major beef producing nations - Canada, the U.S.A., Australia and New Zealand - are all in the expansionary phase of what may be termed "world beef cycle". The implications of this phenomenon merit consideration as well.

Feeder Cattle Exports

The predictions of heavier supplies of slaughter cattle in Canada, in 1974 and beyond, may not come to pass because of the confluence of a number of forces which may conspire to increase the outward flow of feeder cattle. Factors which will contribute in a more or less marked degree to the flow of feeder cattle to the U.S.A. include:

1. The present cost of feed grains on the prairies. While feed prices are not substantially higher on the prairies than for the same grains in the U.S., we must recognize that the prairie cattle finishing industry is almost totally dependent upon feed grains, while the American industry can rely, to a greater degree, on silages and corn.

2. American cattle feeders have a number of competitive advantages in cattle feeding such as tax provisions, input costs (exclusive of the present cost of energy), climatic considerations, economies of scale, futures market, etc.

3. The demand pull for feeder cattle occasioned by Mexico's stated intentions of reducing to zero, over the next three years, the export of live slaughter and feeder calves to the U.S.A. Whereas these exports in 1973 totalled 638,000 head, this represents a very significant potential loss of feeder cattle to the U.S.A., and a consequent increased demand for Canadian feeder cattle. One can take two views of the question of feeder cattle exports.

On the one hand, one can argue that to the extent that we can produce feeder cattle in excess of domestic needs and export some to the U.S.A., this represents an activity that affords a livelihood to farmers and ranchers, and thus, contributes in some measure to economic activity and balance of payments. In addition, the southward flow of feeder cattle can help maintain Canada on an import basis. The disadvantages of such an orientation are obvious:

a) it tolerates a less competitive industry;

b) it precludes, or at least complicates, the exploitation of foreign markets;

c) it enhances the environment for the importation of slaughter cattle and/or carcass beef and special cuts;

d) it therefore diminishes economic activity, and finally;

e) there is always the danger that in the face of adequate or surplus production, the U.S.A. may find reason to limit the importation of Canadian feeder cattle.

On the other hand, one can argue that the best orientation would be an industry in which all, or nearly all, of the feeder cattle are fed out, slaughtered and processed in Canada, with production surplus to demand being exported as product. This maximizes economic activity and maintains the industry somewhere below the import ceiling. Such an orientation is only possible, however, if the Canadian industry becomes fully competitive with the American industry.

It is quite apparent which route is the more desirable in the long run. However, the answer does not lie in arbitrarily limiting the outward flow of feeder cattle, or indeed in arbitrarily limiting the inward flow of slaughter cattle, but rather in creating an environment in which the Canadian beef production industry can be fully competitive with the American industry. It is self-evident that this is not the present case when, in 1973, we witnessed the outward movement of 128,000 feeder cattle and the inward movement of 208,000 slaughter cattle. The loss of economic activity to Canada represented by these figures is staggering.

There are a number of steps to take to redress this situation, but none is more important than to remodel the feed grains policy to recognize that the Canadian livestock industry is the largest user of Canadian feed grains. As long as the present impasse exists in respect to the creation of a permanent and equitable feed grains policy, the Canadian livestock industry will continue to wax and wane in counterpoint to the fortunes of the grain industry. A vigorous, stable, expanding Canadian cattle and livestock feeding industry is the best and most reliable customer Canadian grain producers could hope to have. For this reason, we urge that the forthcoming feed grains policy parallels closely the longer term proposals made by the Government, in August of 1973, for 1974 and beyond.

Tariffs and Trade

The beef market in 1973 clarified for all of us the relationship between the American and Canadian beef market and the dominance of the former. At a time when the thrust of Federal Government policy appears to be in the direction of freer trade, it is important to point out that a more imperative principle is true reciprocity of trade. Far from resisting the idea of free trade, Canadian beef producers nonetheless believe that true reciprocity must be the first objective, and creation of a truly competitive industry a prerequisite to steps in the direction of reduced tariffs.

At the present time, there are important distortions in the trade agreements between Canada and the U.S.A. where, in several instances, the American Government imposes either quotas and/or higher tariffs than apply in the reverse direction. This has been fully documented before and it seems that two important steps must precede the ultimate realization of freer trade in live cattle and beef. These are as follows:

1. The institution of proportionate reciprocity. For example,

    a) The present American quota on live cattle imports of 400,000 head (120,000 per quarter), which triggers a higher tariff, should be met with a 40,000 head (12,000 head per quarter) quota on American cattle imports on the same class of cattle.

b) The present American 10 percent ad valorem tariff on certain types of beef cuts should be responded to, not with the present three cents per pound Canadian tariff, but with an equal 10 percent ad valorem tariff.

2. The competitiveness of the Canadian beef industry relative to the American industry must be assessed and better understood, and all possible steps taken to improve our competitive position.

Having taken these steps, the stage will be set to commence the process of orderly tariff reductions. Let us not, however, get the "cart" of freer trade before the "team" of full reciprocity and a fully competitive industry.

Summary

The intent of this paper was to discuss implications and alternatives for the industry with attention focussed on the major groups involved in the industry. At the risk of over-simplifying a complex subject, I will now list the implications as I see them.

Implications for the Producer

Cow Calf Operator - There is a case to be made for a consolidation, NOT ATTRITION, of the commercial beef breeding herd. Expansion has probably proceeded at a more rapid rate than is generally recognized. Selective culling and stabilization of individual herds at present levels will leave the industry poised in the best possible position to advance when conditions warrant.

Feedlot Operator - Cattle feeders don't need to be reminded that profits in 1974 may be elusive. Heightened awareness of break even prices is essential when replacements are purchased. Even during the hectic 1973 period, the Canadian industry showed great maturity and restraint in maintaining an orderly flow to market. This must continue in 1974.

For the Packer - Moderately heavier supplies of fed cattle for total cattle are in prospect for 1974 with sharper increases in 1975 and beyond. Packers should seek to more fully exploit the Canada H R and I trade and should also remain alert to emerging export opportunities.

For the Consumer - Beef prices are not excessive in any way nor will they be throughout 1974. However, consumers must learn to recognize that food prices are moving in the same league as incomes and provided incomes rise as rapidly as cost of living (at present, incomes are rising more rapidly). Consumers have no legitimate basis for protest. The irony, of course, is that this is a lesson that is well understood by most consumers, but too often overlooked by the urban press and politicians.

For Governments - Many implications are important to Governments and the governed.

- A retreat from arbitrary measures to stimulate still further increases in the national beef breeding herd.

- The conception and institution of a feed grains policy that is satisfactory and fair to livestock and grain producers throughout Canada.

- Our Federal Government is to be commended for the restraint it exercised in 1973 as compared to the American Government. The most undesirable feature in 1973 was the unilateral withdrawal of the import tariff on February 20th, 1973, and hopefully, such a measure will not be repeated in 1974. The temporary import surcharge was handled masterfully and is being withdrawn in an orderly manner.

- A reorientation of priorities in regard to the sequence of:

  a) Reciprocal Trade Arrangement

  b) Fostering a U.S. Competitive Canadian industry

  c) Orderly movement toward freer trade

  to progress in that order. Above all, there must be co-operation between all of the interest groups named above.

HOG OUTLOOK

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Current Situation

During 1973, the North American hog industry was marked by a series of unusual developments which have added more than normal uncertainty to the hog industry.

In 1973, there has been a continuation of the downswing in North American hog slaughter which commenced in late 1971, over two years ago. For the year 1973, hog slaughter in Canada and the U.S. was down 3.4 and 8 percent respectively from 1972. The drop off in North America's hog slaughter, already one of the longest downturns on record, began due to very low hog prices during 1971. It has been extended, despite record high hog prices, primarily because of sharply rising feed prices since the fall of 1972.

From the very low levels of 1971, hog prices in the North American market rose throughout 1972 and continued sharply upward into 1973 (Figure 1). For the year 1973, the Canadian weighted average price per cwt of dressed hogs[1/] averaged $52.36, while at the seven U.S. markets, barrows and gilts averaged about $40.55 live ($52.65 dressed)[2/]. In both countries, the increase in price was over $17 per cwt dressed from 1972.

In North America, strong consumer demand, relatively lower beef supplies, and a strong Japanese outlet, boosted hog prices for smaller supplies of pork substantially in 1973. However, hog prices have fluctuated widely during 1973. After the U.S. lifted the price ceiling on pork July 18, hog prices increased sharply but since late summer prices have dropped off in both countries. By December 1973, the monthly average at Toronto for index 100 was down to $57 per cwt, $11 below the August "peak" but $13 above December 1972.

A significant Canadian pork trend is the recent rise in exports of pork (Figure 2). From 1969 to 1972, Canada's exports of dressed pork more than doubled, from 54.9 million pounds to 111.2 million pounds. The increase was largely accounted for by the dramatic increase in exports to Japan -- from 4.3 million pounds in 1969 to 45.4 million in 1972.

To the end of October 1973, exports of pork to all countries at 108.4 million pounds (44.4 to Japan) are only slightly lower than for the full year 1972. Imports of pork to October end 1973 totalled 42.1 million pounds, virtually the same as for the full year 1972.

[1/] Excludes Index 67, 80, sows and stags.

[2/] Conversion rate of 77 percent to dressed equivalent.

Since 1969, Canada has also increased its exports of live swine which primarily go to the U.S. for slaughter (Figure 3). For the year 1972, exports totalled 88,725 head, and to the end of October 1973 totalled 74,000 head.

United States Outlook

The U.S.D.A. reported 45.9 million hogs on farms in the ten Corn Belt States at September 1, 1973, virtually the same as a year ago.

According to the U.S.D.A. on December 18, 1973[1/]: "First half 1974 hog slaughter and pork production will continue to lag year-earlier levels. On balance, a 3-5 percent reduction in slaughter this winter may be followed by a smaller decline of 2-4 percent in the spring. Reports of farrowing intentions indicate no increases are planned for the December 1973 - February 1974 pig crop. These hogs will reach market weights next summer. But by then, producers may be back to feeding more normal rations if feed prices are lower. Consequently, slaughter rates could increase some because of a shortened feeding period." According to the U.S.D.A., hog producers this winter may be encouraged to increase slightly the number of sows bred. "This would result in a small increase in March-May 1974 farrowings. Such an increase, together with a shorter feeding period, could mean an increase in 1974 fall slaughter."

For the week of December 15, 1973, barrows and gilts at the seven U.S. markets averaged $39.25 per cwt live and for the week ending January 19, 1974 moved up to $41 per cwt.

Hog prices this winter are expected to strengthen, according to the U.S.D.A., and for the first half of 1974 average in the "$42-$44 range" ($54.55-$57.15 dressed) compared with an average of $36.14 per cwt ($46.95 dressed) for the first six months of 1973. During the last half of 1974, hog slaughter is expected to rise somewhat, reflecting more normal feeding programs, and with beef output expected to be up substantially, "hog prices will trend lower during July-December and average below the 1973 last half level when barrows and gilts at the seven markets averaged about $45 live" ($58.45 dressed).

However, more recent U.S.D.A. information (the December 1, 1973 Hogs and Pig Report released in late December) clouds an already uncertain U.S. supply-price hog outlook. While the December 1, 1973 estimates of the June-November 1973 pig crop, down 3 percent from 1972, is in conjunction with the U.S.D.A. slaughter outlook, it is difficult to reconcile the difference with the estimate of a 4 percent increase in December 1 inventories of market hogs. It could reflect some combination of significantly slower gains on hogs and thus delayed marketings. Higher feed costs lend support to the view that gains and marketings have slowed up.

[1/] Outlook For Livestock and Meats, talk by John Larsen, 1974 National Agricultural Outlook Conference, Washington, December 18, 1973.

In balance, given the range of uncertainty that prevails, U.S. hog slaughter during the January-June 1974 period may be expected to average close to the 1973 first half level. Prices should still hold up and for the first half of 1974 average near the $40 level ($52 dressed). It is pertinent to note that during October-December 1972, when no increase in U.S. breedings occurred, the hog-corn price ratio averaged 22 to 1. For the same period in 1973, the ratio dropped to about 18 to 1 (Figure 4).

Canadian Outlook

The September 1, 1973, Quarterly Pig Survey by Statistics Canada reported pig numbers on farms at 7,078 thousand head, down 2 percent from the same date in 1972. Sow farrowings in Canada for the June-November 1973 period are down 1 percent from the same six months of 1972. Thus hog slaughter (gradings) in Canada through the first half of 1974 can be expected to average close to 1973 first half levels. For the last half of 1974, total hog gradings in Canada will depend largely upon the size of the spring pig crop (December 1973 - May 1974 farrowings).

Developments associated with the Canadian hog industry since the September 1, 1973 pig survey suggest hog slaughter during 1974 may be lower than previously indicated.

Since the unusual high summer price levels, hog prices have declined substantially during the fall period. On the other hand, feed grain prices, the major part and influence in hog production costs, have moved upward. Thus the relationship between hog prices and feed costs during the fourth quarter of 1973 has been less conducive to increased hog breedings than compared with the fall of 1972, when no increase in breedings occurred. In part, this is illustrated by the trend in the Hog-Barley price ratio during the fourth quarter of 1973[1].

Another indication why 1974 spring farrowings may be reduced compared to 1973 is the increase in sow slaughter during the fall period. While sow slaughter is seasonally greatest during the fall, the relatively higher level during the fall of 1973, particularly in Alberta and Saskatchewan, implies that some liquidation of breeding stock may have occurred.

[1] Hog - Barley Price Ratios,[a] By Quarters

	1972	1973	Change in Ratio
First Quarter	22.9:1	25.0:1	+2.1:1
Second Quarter	23.9:1	21.1:1	+2.8:1
Third Quarter	25.2:1	20.2:1	-5.0:1
Fourth Quarter	24.5:1	19.4:1	-5.1:1
Year	24.1:1	21.4:1	-2.7:1

[a] The number of bushels of No. 1 feed barley (Thunder Bay) equivalent in price to the value of 100 pounds of Index 100 hogs live at Winnipeg.

On balance, while weekly Canadian hog slaughter in early 1974 will at times average above a year ago, 1974 first half slaughter as a whole may be expected to average around 3 percent below the 1973 first half level. This decrease will be largely due to an expected decrease in farrowings during late 1973 and early 1974. The 1974 spring pig crop (December 1973-May 1974) may be expected to average below the 1973 level, with most of the decrease in Western Canada. Hence, hog slaughter in Canada during the last half of 1974 may be expected to average out somewhat below the 1973 last half level.

For the year 1973, index 100 at Toronto averaged $54.66 per cwt dressed, compared with $37.89 in 1972. For the week ending January 19, 1974, index 100 at Toronto averaged $53.29, compared with $44.81 for the same week in 1973.

During 1974, Canadian hog prices will continue to change in line with the basic North American hog prices as reflected by the price at the seven U.S. markets. For the first half of 1974, index 100 at Toronto can be expected to average slightly above the 1973 first half level of $49 per cwt. The seasonal rise in prices next summer can be expected to be less pronounced than compared with the summer of 1973, which reflected the lifting of the U.S. price ceiling on pork in mid-July. If the U.S. price prediction comes about, that is, hog prices trending downward during July-December 1974 and averaging below 1973 last half levels; then prices at Toronto during the last half of 1974 can be expected to average below the last six months of 1973, when index 100 at Toronto was at unusually high levels, averaging $60.50 per cwt dressed.

THE CHANGING HOG CYCLE

For many years, hog production in North America has tended to follow a fairly regular pattern. There has been approximately two years of low production (slaughter) and high prices followed by about two years of higher production (slaughter) and lower prices. In part, using annual data this is illustrated in Table 1.

In recent years, hog slaughter, pork consumption, and hog prices have all moved to relatively higher plateaus from which to stage the "ups" and "downs" in the North American hog cycle. This suggests that rather than short supply, it is strong consumer demand for pork that has been pushing up the price of hogs. In North America, domestic and foreign demand for pork during 1973 was exceptionally strong. However, in 1974 the demand for pork in North America, reflecting uncertain economic activity, contributes some uncertainty to the price outlook for hogs.

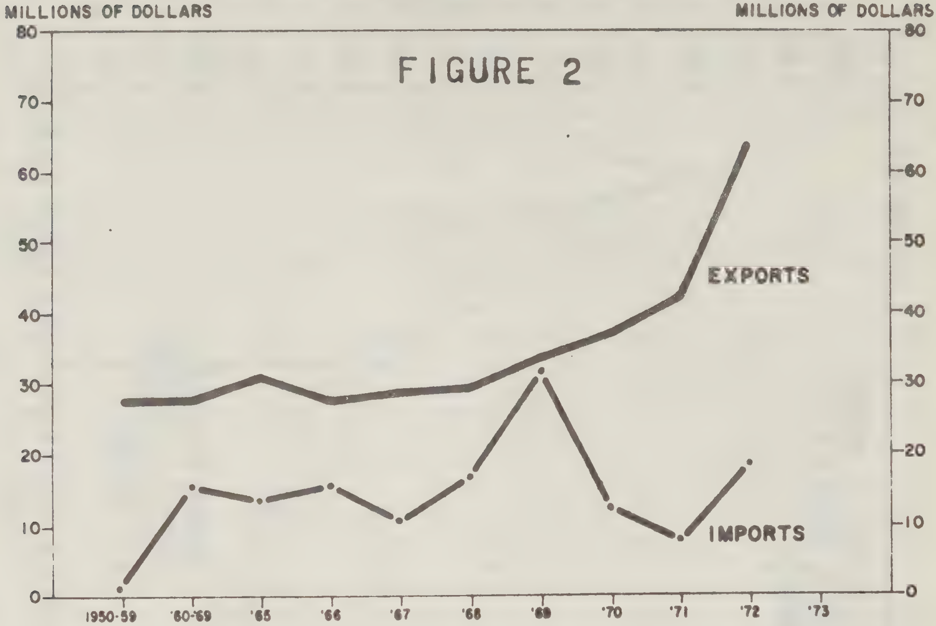
Beginning in 1972, we have had a succession of unusual developments which appear to have interrupted the normal pattern of the North American hog cycle. With hog prices at record levels during 1972-73, a normal pattern would have us entering an expansion phase of hog slaughter during the fall of 1973. However, in the immediate future at least, no significant increase in slaughter is in sight. In the longer-run, increased hog slaughter and somewhat lower price levels seem probable in 1975.

FIGURE 1


PRICE PER CWT. OF INDEX 100 HOGS AT TORONTO
AND BARROWS AND GILTS AT SEVEN U.S.
MARKETS (MONTHLY)
DOLLARS PER CWT.
DOLLARS PER CWT.
0 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84
INDEX 100 TORONTO
CAN. DOLLARS
BARROWS AND GILTS
SEVEN U.S. MARKETS
DRESSED EQUIVALENT
U.S. DOLLARS
D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1970
1971
1972
1973

CANADA: EXPORTS AND IMPORTS OF PORK

(Fresh or Frozen, Processed, and Canned)



CANADA: EXPORTS AND IMPORTS OF LIVE HOGS

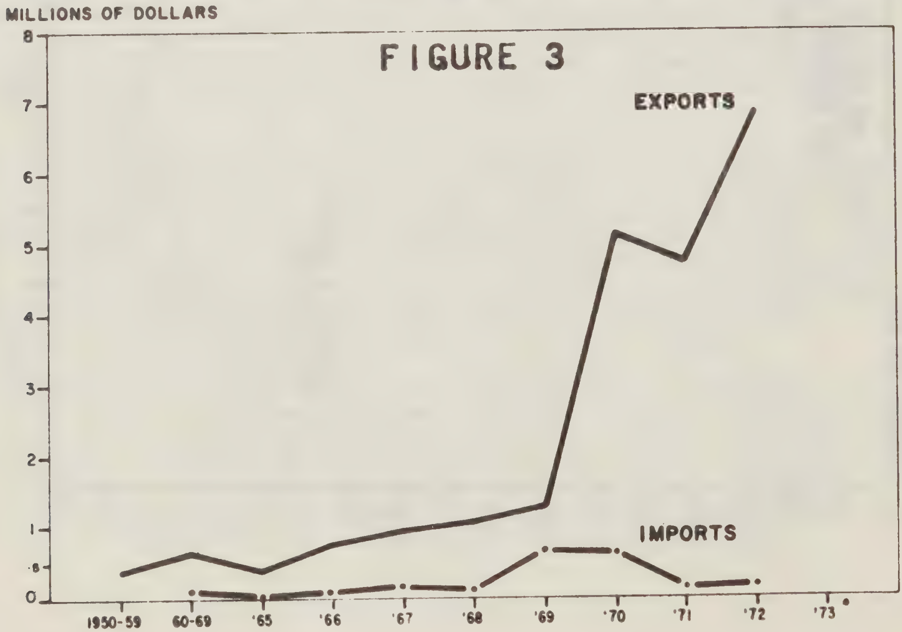
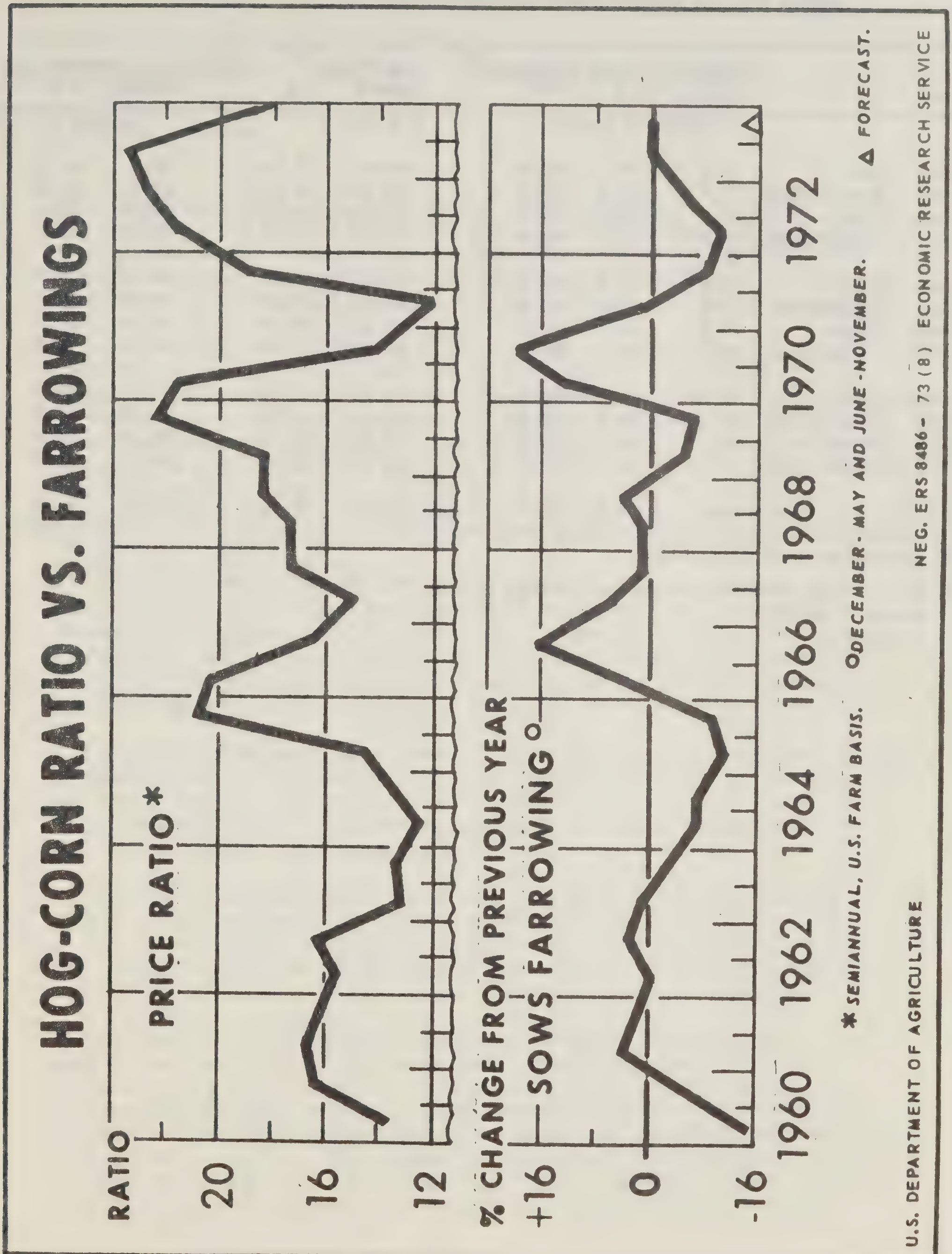


FIGURE 4



HOG-CORN RATIO VS. FARROWINGS
RATIO
PRICE RATIO*
20
16
12
% CHANGE FROM PREVIOUS YEAR
SOWS FARROWING°
+16
0
-16
1960
1962
1964
1966
1968
1970
1972
* SEMIANNUAL, U.S. FARM BASIS.
° DECEMBER-MAY AND JUNE-NOVEMBER.
Δ FORECAST.
U.S. DEPARTMENT OF AGRICULTURE
NEG. ERS 8486 - 73 (8)
ECONOMIC RESEARCH SERVICE

TABLE 1 - COMMERCIAL SLAUGHTER, HOG PRICES AND PER CAPITA CONSUMPTION, CANADA AND THE UNITED STATES, 1961 TO 1973

Year		Commercial Hog Slaughter[a]			Hog Prices[b]		Per Capita Consumption	
		Canada	U.S.	Total	Canada	U.S.	Canada	U.S.
		- million head -			- $/cwt -		- pounds -	
1961	(Low	7.6	77.3	84.9	28.00	17.16	50.3	62.0
1962	Production)	7.7	79.3	87.0	28.30	16.82	50.1	63.5
1963	(High	7.6	83.3	90.9	27.30	15.38	50.7	65.4
1964	Production)	8.3	83.0	91.3	26.23	15.31	51.8	65.4
1965	(Low	7.9	73.8	81.7	31.57	21.30	47.9	58.7
1966	Production)	7.9	74.0	81.9	35.14	23.49	46.9	58.1
1967	(High	9.2	82.1	91.3	29.53	19.37	53.8	64.1
1968	Production)	9.2	85.2	94.4	29.59	19.19	53.6	66.2
1969	(Low	8.7	83.8	92.5	34.69	23.71	51.9	65.0
1970	Production)	10.1	85.8	95.9	30.14	21.95	56.9	66.4
1971	(High	11.6	94.4	106.0	23.67	18.45	65.9	73.0
1972	Production)	10.6	84.7	95.3	34.97	26.67	61.1	67.4
1973[c]		10.3	78.0	88.3	52.34	40.55	59.0	61.0

a/ Inspected plus uninspected.

b/ For Canada, National weighted average price; For the U.S. live price at 7 midwest markets.

c/ Provisional.

HOGS — IMPLICATIONS AND ALTERNATIVES

S.S. Berg
High/Bred Stock Farm
Ardrossan, Alberta

Each year representatives from across Canada who have a stake in the food industry gather here in Ottawa to look at statistical reviews of the past year. A comparison is then made to previous years. The commodities which are identified as having lost advantage are often the recipients of short-term programs set up to supplement their incomes.

Analysis of what went wrong is a fairly simple exercise. It is merely a matter of "hindsight" documented by statistics which identify what happened. The relevance of these "happenings" in determining the programs of the future raise serious doubts in my mind. How can one predict the effect of consumer boycotts, or sharply higher feed costs, or unexpected controls on meat prices, or devaluation of the U.S. dollar, or continued downswing in hog numbers -- all of which took place last year? We certainly can't expect Allan Boswell to have predicted these crises a year ago so that programs could have been developed to prevent their appearance in the page of our history.

The balance of supply and demand is very delicate. Any interference whether by producer decision to increase or decrease supply, by consumer reaction to inflation, by political reaction to resulting consumer boycott, by crop failure or surplus can tip the scales. At these Outlook Conferences our process of decision has been based on REACTION.

All segments of a particular commodity are forced to ride a giant roller coaster which is designed by REACTION DECISION. The extent to which the curve varies is aggravated by determined action of all segments to maximize profits when the curve peaks in preparation for losses when the curve bottoms. Two examples are:

1) The Food Prices Review Board taking the egg producers to task on behalf of the consumers for making what they call unreasonably high profit. The Egg Producers Marketing Board's reacting by stating that egg prices were so low in the recent past that profits of this nature are necessary to make up for losses incurred during that period.

2) Reaction of the livestock producers in Western Canada to Mr. Lang's Feed Grain Policy where we have documented that the eastern producer using grain under the new policy is being subsidized 11 dollars per hog, thus creating great inequity between east and west. In addition present feed prices are so high that livestock producers cannot make a profit. The resulting reaction of the grain producer is that he points out that in '68, '69, '70, he produced grain at a terrible loss and therefore the profit of the present is justified.

So the design of the "DECISION BY REACTION" roller coaster reaches new highs and new lows. The amazing thing is that we're all riding it - producers, processors, food service industry, consumers, and politicians. That's everyone in our society. We're all riding and reacting wildly to one another.

WHAT IS THE SOLUTION?

1. Recognize that programs based on Reaction can only be short-term... that a future based on the "excessive loss - excessive profit" concept ties you to wild fluctuations which are not healthy and which will not generate growth.

2. Admit failure of this approach and begin to design new approaches specifically to stimulate INTERACTION of commodities and segments within each commodity needing each other's help.

We must recognize that it is not within the power of one segment to determine long-term future programs, but all segments having a stake in that future must have an influence. In order to survive there must exist a reasonable level of prosperity in all segments. The ideal system which produces a mutually beneficial result at all levels up to and including the consumer must be encouraged.

You will note that I have said "encouraged". A Forward Marketing Concept has already been designed and a spearhead developed in the province of Alberta. We have opened new opportunities for trade on the world market level. This market is tied to a long-term arrangement which guarantees continuity of supply at a price which reflects grain and concentrate and controls delivery prices on a month to month basis according to real cost fluctuations. The first contracts were sold in May and our experience has shown that gross profit margins have been maintained just over 36 dollars per hog and have varied month to month a total of only 20 cents per hog.

Once significant volumes are committed, hog producers in Alberta will be in a position to contract feed grain requirements for the term of the future commitment of hogs. This is the beginning of the INTERACTION concept necessary to exploit the growth potential of agricultural Canada. Many other opportunities will become evident as our approach becomes more sophisticated.

As significant volumes are committed, our Canadian market will gradually be brought into focus with the world market. Once this stage is reached we will be in a position to make long-term commitments on the North American market as well.

The core of the concept is very simple. Decisions to produce are based on commitments to buy over a sufficiently long term to cover generation and capital turn over. Therefore, the real stabilization requirement, that of gearing supply to demand, will be predictable in real terms,

not by hindsight, myth, hope, faith or politics. The concept is flexible and applicable to all commodities except those which have opted for quota production. The potential is unlimited and in our view could revolutionize the development of our future capacity as a food producing nation. The mutual benefits already evident can result in total benefits for all segments of society in this country.

POULTRY OUTLOOK

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Economics Branch
Agriculture Canada

POULTRY MEATS

A higher level of disappearance of poultry meat in Canada is likely to continue, particularly as a result of firm red meat prices and the continued development of processed poultry products.

Chicken

Broiler chicken marketings through registered processing plants in Canada in the January-March period of 1974 are forecast at 46.6 million head, or 137 million pounds, which is down slightly from last year. Storage stocks are considered high and domestic disappearance for the same period might increase slightly over the first quarter of 1973 levels if prices are lower. Producer prices in 1974 will be influenced by feed and other production costs.

Broiler prices in the U.S. are expected to rise in the winter and spring in line with continuing relatively high red meat prices. Canadian marketings for 1974 are expected to be about 3 to 5 percent greater than 1973. However, domestic disappearance and cold storage levels will have an effect on marketing board decisions as the year progresses. Marketings and disappearance of roaster chickens are expected to remain steady and in balance. Production in 1974 is expected to be about 70 million pounds or about 13 percent greater than in 1973.

Turkeys

Broiler turkey marketings through registered processing plants in Canada for the first quarter of 1974 are forecast to total 2,214,800 birds, up 5.5 percent from the same period in 1973. The 1974 marketings are expected to be 79.0 million pounds, or about 37 percent of the national turkey production of about 215 million pounds. Domestic disappearance for 1974 is expected to continue its upward trend.

Marketings of heavy turkeys in the first quarter of 1974 are forecast at 716,000 birds (413,000 hen weights and 303,000 tom weights), an increase of about 17 percent from the first quarter of 1973. Hen weights are expected to be about 23 percent of all turkey meat or about 50.0 million pounds. Tom weights will amount to 86.0 million pounds in 1974 or about 40 percent of the national production.

Turkey prices, for the first quarter of 1974, will be influenced by feed costs and other production costs but probably will remain above first quarter 1973 prices.

Last November the National Turkey Co-ordinating committee allocated 210.0 million pounds for 1974 for those provinces west of the Maritimes. An additional 4.5 million pounds are expected from the Maritimes. This allocation was subject to year-end storage stocks being at manageable levels and could increase if there is a stronger demand for table use or if further processing markets are evident. On December 18, 1973 the Canadian Turkey Marketing Agency became a reality and their first meeting was held on January 24 and 25, 1974. The Agency has adjusted the national allocation to bring cold storage stocks to a manageable level and anticipate an increase of 2 percent in turkey meat supplies in 1974. This means that the national quota for all turkey meat is 206 million pounds. Most of the reduction in poundage should occur in the broiler weight birds with some heavies being marketed at lighter weights. The Agency is also prepared to increase available supplies if market conditions warrant a greater expansion than the anticipated 2 percent.

EGG

Egg marketings by producers through registered grading stations in Canada for the first quarter of 1974 are forecast at 2,765,000 cases of thirty dozen, an increase of 2.6 percent over the first quarter of 1973. Layer numbers on farms at January 1, 1974 are estimated at 26.5 million birds compared to 26.6 million last year. The rate of lay during the first quarter of 1974 is expected to be about the same as in 1973.

The Canadian Egg Marketing Agency, along with provincial egg boards, are hopeful of adjusting production to bring supply in line with effective demand. Export sales have been arranged and additional markets are being sought. It would appear from the estimated number of layers on farms in early 1974 that marketings through registered grading stations will be in excess of domestic disappearance. Although any decrease in price could influence the rate of consumption, it could also influence breakers to increase their storage holdings of frozen egg products which are currently at 4.6 million pounds. This is about one half of the holdings a year ago.

The Canadian Egg Marketing Agency has announced that the offer to purchase prices will be established on the basis of cost of production. Therefore, price changes in 1974 are expected to be in response to changes in feed costs and other changes in costs of production.

STATISTICS REVISION OF POULTRY AND EGGS MARKETINGS

	Marketings 1972	1973*	% change	Domestic Disappearance 1972	1973*	% change
Eggs ('000 cases)	10,552	10,728	+ 1.6	9,756	9,478	- 2.9
Chicken ('000 lbs)						
Broilers	567,204	591,377	+ 4.2	566,900	583,400	+ 2.9
Roasters	66,729	62,836	- 5.8	62,400	65,600	+ 4.3
Turkey ('000 lbs)						
Under 10 lbs	68,612	74,880	+ 9.1	70,100	72,100	+ 2.8
10-16 lbs	45,365	51,757	+14.1	49,000	48,600	- 0.8
Over 16 lbs	85,533	89,895	+ 5.1	88,400	87,200	- 1.3

*Preliminary.

STORAGE STOCKS AT JANUARY 1

	1972	1973	1974*
Chicken ('000 lbs)			
Broilers (under 4 lbs)	5,691	8,584	13,050
Roasters (over 4 lbs)	3,379	8,624	4,868
Further processed	10,310	8,848	14,105
Total Chicken	19,380	26,056	32,023
Fowl	5,231	4,544	4,831
Turkey			
Broiler (under 10 lbs)	4,252	3,906	7,327
Hen wts. (10-16 lbs)	5,976	4,205	8,097
Tom wts. (over 16 lbs)	17,596	13,915	16,900
Further processed	2,462	1,519	2,137
Total Turkey	30,286	23,545	34,461

*Preliminary.

POULTRY — IMPLICATIONS AND ALTERNATIVES

B. Lavigne
Chairman
Quebec Agricultural Marketing Board
Montreal, Quebec

> "Pottery clay is shaped into vases but it is their cavity which sets their use".
>
> Tao
>
> Thus it is with Outlook.

I was asked to present some implications and alternatives for the 1974 Poultry and Egg Outlook. It is impossible to cover the whole subject, but we hope that the question period will help you make the best possible use of the information Mr. Longmuir has just presented.

It is most often noted that when an outlook is well disseminated to producers and well received by them, it often creates its own undoing. The more outlooks are accurate and dependable, the more they are seriously taken into account and they guide the actions of both the producers and the tradesmen, the less there is a chance of the predictions coming true.

Fortunately, such a prospect does not deter from their task those individuals who dedicate most of their professional efforts to the formulation of outlooks.

The poultry sector is a very favoured one when you consider that government services make special efforts to provide statistics on quota production, interprovincial trade and off-quota outputs. We thank the economists for it and do hope that they will continue it.

Let us take the poultry data as accepted fact, but let us try to find if some exterior factors might not affect the behaviour of the industry during the coming year. Consider, for instance:

1. the administrative amalgamation of national programs;

2. the disciplinary control of supply;

3. the myth of self-sufficiency;

4. nationalization of surplusses;

5. interlocked outlooks;

6. excessively hasty estimations by consumers.

If the chicken plan is soon adopted, all poultry products this year will be under national plans. The management of supply is the most modern tool producers can use to get the best possible results from outlook. This prerogative is a great worry to the most active consumer representatives and calls for serious comments which I hope will be accepted in good faith by the groups that are represented here.

The administrative amalgamation of national plans

Quantitative outlook data can be most dependable, but the use of this data for selfish purposes may be questionable. Administrators of a plan or those who steer the management of supply can use statistics as a one way only without heed for consumers, the trade or the public interest taken as a whole. It seems that producers are exaggerating when they claim exclusive power in this matter. Are they trying to run a closed shop? We can readily agree that provincial marketing boards for one product may be solely formed by some of its primary producers. But from that to accepting what these same boards insist, as is presently the case, that only producers shall be directors of a national agency which manages the total supply and stabilizes prices, that is a mistake. There lies the danger of taking unfair advantage for absolutely selfish purposes and of depreciating prematurely an indispensable, valid and warranted tool. With time, such an action could work against the interests of any group using such a short-sighted policy. At least, the interest of the public should be well represented on the management of such national boards.

Some of the most radical members even pretend that the National Marketing Board should be formed by a majority of producers. Is there no respect for the interests of affected groups? It seems that a very serious carelessness exists about the eventual need for an equitable arbitration. Those who are appointed to such a Council should be conscious that they will be called to settle issues during the normal course of the activities of these boards. In fact, things went even too far at the level of the Council in regards to regional representation, which weakens the arbitration capacity of the said Council. In our opinion, the legislation which created it involves the two serious deficiencies which we just mentioned.

Disciplinary control of offerings

Concerning the future of the poultry industry and its outlook under national plans, there is still another element to scrutinize, that is the disciplinary measures to be taken to ensure that individual and provincial quotas will be respected. With good prices prevailing, the temptation to cheat could be strong for producers as well as for provinces. Will they limit themselves to their quotas? For instance, recent placements of laying pullets and broiler chicks are an ill omen for the maintenance of a wanted and agreed discipline. Even there, the possibility of launching new plans could be highly endangered and a good outlook could be irremediably spoiled. A system of very strict and equitable penalties should be applied against individuals as well as against provinces.

Myth of self-sufficiency

Another incident which occurred while setting up the national plans was the great distortion of the short and long-term outlooks for incomes to be received from a product. Recalling that the simple fact of having mentioned prematurely the chicken plan, that is since 1967, has strangely changed the interprovincial distribution pattern of production. Efforts to capture quotas before the fateful date on which these plans were to become effective never took into consideration the comparative costs of production. With a few exceptions, the provinces, during the last three years, have increased their production, aiming at bigger shares in the event of the establishment of marketing quotas at the national level. This is the explanation for those crises before 1972. It is regrettable that most of them were too successful as regards broiler chickens. Furthermore, there is a risk that the national price policy will aim at covering production costs which are higher for new producers than for old ones whose equipment and buildings are already amortized. Such an occurrence would be unfair to public interest, although it would be profitable for old producers.

Nationalization of surplusses

Another aspect of national marketing related to self-sufficiency and which could affect the behaviour of a product on the market, concerns the attitude of provincial spokesmen and organizations about surplusses. The underlying sophism would read as follows: "As we produce only 50 percent of our needs, we cannot be responsible for marketing surplusses, and only the provinces with surplusses should pay for it". This constitutes the worst stumbling block of orderly marketing. Our market is Canadian; there should be no frontiers between provinces. If this market is to be orderly, only the nationalization of surplusses with a central management can protect us against sharp price jumps. Export markets, surplus pools, export pools, and compulsory levies for this purpose are all available mechanisms with which the boards could manage this problem for good.

Interlocked Outlook

Poultry producers will certainly never forget that the price outlooks over which they have a relatively good control are narrowly bound to those of feed grains and proteins which were discussed yesterday. Considering this, we should acknowledge the excellent initiative taken by national and provincial agencies in checking, on a weekly basis the fluctuations of their production costs, especially those of feed supplies.

Moreover, it seems useless to underline that all the Canadian poultrymen will anxiously watch the crucial progress and outcome of a permanent national policy on feed grains.

Excessively hasty estimations by consumers

Finally, it may be a good thing to hearten consumers about what happened in 1973. Retail price increases in 1973 have to be reduced at a compound

rate to arrive at a farm price. Thus, if a product gets a 10 percent increase at the farm, and has to go through three or four marketing stages, one of which is a processing operation calling for a 40 percent margin of increase, and the other two are distribution operations, each adding another 10 percent to the costs, the final product is as follows: 110 X 144 X 111 X 111 = 195.16

According to these figures, a product originally costing $1 would be sold at $1.95 to the consumer, while previously with constant margins at all levels it was selling for only $1.69. Under such an hypothesis, with a 10 percent increase at each level, the compound rate would mean a total increase of 15 to 16 percent at the retail level. This stirs the consumer's anger against primary producers which in fact benefited by only a 10 percent improvement of their gross income, an increase which is far from being a net one since, in this case, the inputs might have gone up similarly.

CONCLUSION

In modern agriculture there is a growing need to have a better knowledge of reality, a better idea of what can happen in the next few months, and the pace of current cycles. We welcome new tools which would help to partly control the future of the poultry sector and also give the possibility of excellent income from an average outlook. May the skill, the sagacity and the discernment of administrators through all the poultry industry prevent cycles which have always repeated themselves at a dangerous rate for the poultryman's pocketbook.

DAIRY OUTLOOK

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Total milk production in Canada in 1973 is estimated at about 16.9 billion pounds, a decline of close to 5 percent from 1972 levels. This was the sharpest percentage drop from year-earlier levels since Statistics Canada began gathering milk statistics in 1920.

Milk output in Canada may improve in 1974, but much will depend on prices at the producer level in relation to costs of feed and other farm inputs, availability of reliable farm labor, and alternative opportunities, particularly for grain and beef production. Higher costs of energy and a continuing high degree of inflation in the national economy would also adversely affect milk production. The Federal subsidy program, a temporary provincial fluid milk subsidy plan in Manitoba, and an income stabilization plan for dairymen in British Columbia together with several provincial capital assistance programs were designed to encourage expanded milk output. Because of production lags, the full effect of many of these programs will not likely be evident for some months.

These actions coupled with better quality hay and silage generally available in most of the main milk producing areas of Ontario and Quebec indicate that milk production in the winter months will exceed the low levels of a year ago. However, in certain areas of British Columbia, Manitoba and the Atlantic Provinces, smaller hay crops and reduced hay quality will have an adverse effect on milk production.

About 100,000 fluid milk and industrial milk and cream shippers were registered with the Canadian Dairy Commission at the beginning of 1974. This represents a decline of about 6 percent from a year-earlier.

The decline in milk cow numbers at June 1, 1973 was around 2 percent from year-earlier levels. This has been about the average rate of decline in recent years. Numbers of yearling heifers being raised for milk purposes were up by 3 percent. The number of heifers that enter the milking herd will depend largely on the export-price/milk-price relationships.

Quebec is indicating a rise in milk output in 1974 from 1973 levels, and expects to regain the output levels of 1972. Ontario production may increase 2 to 3 percent or more, depending on favorable conditions. Output in British Columbia may increase by about 2 percent; no

appreciable change is expected in Alberta, and production in Saskatchewan and Manitoba will likely decline. The Atlantic provinces are not expected to show much volume change from 1973.

Assuming that Quebec output will come up to 1972 levels in 1974 and that Ontario increases production by 3 percent from 1973 levels, total milk output in Canada in 1974 will be about 17.4 billion pounds, an increase of 3 percent from 1973 levels. If conditions for milk production in Ontario are favorable and output reaches 1972 levels, total Canadian production would be about 17.6 billion pounds, a growth of more than 4 percent from 1973, but still below 1972 levels.

Sales of fluid milk and cream for fresh consumption are forecast to continue to expand. The trend toward low fat milk products (2 percent butterfat) and fresh skim milk is expected to continue. Fluid sales, on a milk fat equivalent basis, are forecast to grow by 1.6 percent from 1973 levels. Federal-provincial agreements for fluid milk prices under consumer subsidy arrangements will be a restraining factor in any consumer price increases for fluid milk during 1974.

Production of cheddar cheese is expected to increase in 1974 to 200 million pounds or more, depending on export possibilities. Domestic consumption will likely continue upward, but the increase may not be as great as in 1973. Exports of cheddar may expand if some acceptable agreement on import levies can be reached with the EEC regarding entry of Canadian aged cheddar into the United Kingdom market. There has been some relaxation of import quotas for Canadian cheese entering the United States and there may be some further relaxation. Thus, cheddar cheese exports to the United States are likely to increase in 1974.

Output of specialty cheeses is forecast to continue to expand and consumption should increase both in total and per capita. Cottage cheese will continue to move moderately above year-earlier levels.

Production and consumption of concentrated whole milk products are expected to continue to decline slightly. Exports of these products will likely be very small. Milk equivalent used in the production of ice cream mix should continue the upward trend which levelled off in 1973.

Given the expected increase in total milk production, the fresh fluid requirements and the production requirements for cheese, concentrated whole milk products and ice cream, larger quantities of milk will be available for the production of butter and skim milk powder as these are the residual products of farmers' total deliveries. Butter production will likely exceed the 1973 output by about 10 million pounds if total milk production reaches 17.4 billion pounds. Any appreciable increase in cheese output due

to export demand will result in less milk for butter production. Butter consumption is forecast to continue to trend downwards, both in total and per capita, but possibly at a lesser rate than in 1973. Some butter imports may be necessary, but these would likely be considerably below those of 1973.

Skim milk powder production is likely to reach 330 to 350 million pounds, depending on butter output. Domestic use will not likely be more than 115 million pounds, leaving a minimum exportable surplus of 215 million pounds. Skim powder exports will likely require some export assistance, but prices on world markets are expected to be moderately above 1973 levels.

Total domestic disappearance of milk and dairy products, plus milk fed to livestock in 1974 will be about 17.8 billion pounds in terms of milk equivalent. This is 400 million pounds in excess of production at 17.4 billion pounds, and 200 million pounds in excess of production at 17.6 billion pounds.

Total farm cash receipts from the sale of milk and cream are expected to reach record levels in 1974. However, most of the increase will likely be offset by higher production costs if cost trends continue. Assuming there is an increase in milk production of 3 percent from 1973 levels, total farm cash receipts from the sale of milk and cream, excluding subsidy payments, should exceed the one billion dollar mark.

International Outlook

Milk production in the United States, which declined 3 percent in 1973 from year-earlier levels, may show a further but smaller decline in 1974, with most of the drop occurring in the first half of the year. An upward trend in milk production, based on cow numbers, is indicated in the EEC in 1974, but economic factors could put restraints on potential expansion. Also, the EEC Commission proposals to modify the Community's dairy policies could affect milk production in Member countries. Milk production and export availability of dairy products is expected to increase in Australia and possibly in New Zealand in 1974.

The year 1973 was a turning point for world dairy markets with the United Kingdom joining the EEC and the United States opening its borders to substantial imports. The entry of the United Kingdom, Denmark and Ireland into the EEC is drastically changing the traditional trade pattern for dairy exports from New Zealand and Australia. The reversal of the United States traditional position to a net importer of dairy products has had a compensatory effect for Oceania. The United States market is a high priced market and is likely to raise the international price level for dairy products closer to those prevailing in the United States. This situation will be accentuated as long as milk output in the United States is declining. Based on existing consumption trends in the United States, greater imports will likely be required by that country in 1974 than was the case in 1973.

DAIRY — IMPLICATIONS AND ALTERNATIVES

Ellard Powers
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It has not been an easy year for anyone to stay abreast of his forecasts of costs made last year. If you take my case as a milk producer, I know, I stand to lose as a farmer what I do not foresee as a forecaster. That makes this Outlook Conference interesting and very practical, and I do, on behalf of my colleagues in the Commission, appreciate the thoughtful manner in which the Dairy Outlook has been written and presented. At this stage in the development of the dairy industry more of us not only act our part as individual entrepreneurs or officials, but also participate increasingly in fashioning the future of the dairy industry. An overview of the developments in world dairy markets may help us to get a fix on the crucial question: "Are we going to depend increasingly on offshore supplies and if so, at what price, or are we heading for decreasing dependence on imports?"

There is little doubt in my mind that the greatest single factor in influencing prices in world dairy markets was the United States which changed its role from one of the world's large exporters to that of a large and growing importer. The impact of this change is magnified by the actual and the potential demand. The United States is in the financial position to translate the demand into purchases at prices close to those prevailing in the United States. This is in contrast with the great latent demand in populous countries such as South America which remains unfilled.

Milk production in the U.S. is down 3 percent for the 1973 year, but in recent months the decline has been in the order of 4 percent. Rising U.S. demand required imports of 290 million pounds of cheese, 77 million pounds of butter and butterfat mixtures, and 265 million pounds of skim milk powder. The magnitude of these imports is illustrated by the fact that the milk equivalent of the cheese and the powder is 6.5 billion pounds which equates with 60 percent of Canada's industrial milk production or about half the production of New Zealand. Unless the accelerating downtrend in milk production in the United States is reversed, the U.S. import requirements in 1974 will greatly exceed those of this year!

Of the four major dairy exporting countries only the EEC has shown any appreciable increase in production this year. Let's look at New Zealand. Early indications were for an increase of 5 percent for the current production season. Now our latest information from New Zealand reveals a decline in the order of 5 percent which has been partly caused by dry

weather, but to a large extent by dairy farmers giving up dairying for beef and other opportunities. The outlook indicates this decline will continue.

Australian production has remained fairly constant. However, recent widespread floods in Queensland and New South Wales have clouded the outlook, at least for the short term.

The only major dairy region in the world where milk production is still increasing, although at a slowing rate of 3 percent, is in the countries of the Common Market.

Against this backdrop of declining milk production and advancing population, it is no surprise that world dairy product prices have advanced at an accelerating pace to unprecedented levels. Forgotten are the days when skim powder fetched less than nine cents for feed purposes. The world price for skim powder moved up from 23 cents Canadian in the early part of the 1973-74 dairy year to above the Canadian support price of 38 cents per pound. Even at these levels it is virtually impossible for importing countries to acquire substantial quantities at the present time.

The situation in world butter markets has changed, but less dramatically. The change in market conditions may be illustrated by the fact that the Commission paid about 19 percent more for the butter acquired this year than last year and that present prices are even higher.

Shall we now return to the question posed at the beginning and evaluate if we have a real alternative to more domestic production? Is this not unlike the "Make (produce) or Buy" decision which many other industries have to face? What if you cannot buy or buy only at higher prices? You may as well produce it in Canada! From this point of view there would appear to be a greater need for Canada to strive for a higher degree of self-sufficiency in dairy production than at any time in the recent past.

Timing is decisive. It means that all partners in the industry must assume their responsibilities, not only at the federal level but also at the provincial level. This involves producer and processor organizations and the provincial marketing agencies. There are many factors which bear on the viability of the dairy industry: economic returns to producers and processors; availability of sound farm financing and a supply of qualified farm labour; solutions to social and structural challenges and opportunities; and regulatory changes to be made.

Decisions which are taken at the various levels will have a bearing on the reliability of the forecasts that have been made, but let us also recognize that developments in the international dairy markets will have an important impact on the results.

HORTICULTURAL OUTLOOK

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APPLES

Canadian apple production in 1973, estimated at 835.0 million pounds, is 3.6 percent below the short 1972 crop and 10.8 percent below the 1966-70 average. The U.S. crop is estimated at 6,026.0 million pounds, 3.7 percent above 1972. European apple production is estimated at 17,615 million pounds, about 8 percent above 1972. Of great significance to both Canada and the U.S. is the area pattern of production - very large in the West and short in the East.

Total Canadian storage holdings of fresh apples on January 1, 1974 were 2.7 percent below the same date in 1973. Holdings in British Columbia are considerably above the 1972 level, while holdings in the East, except in Nova Scotia, are considerably below 1972.

Stocks of processed apple products are extremely low in both Canada and the United States. Demand for processing apples is heavy while available supplies during the 1973-74 marketing year (July 1 to June 30) are low. As a result, prices are at an all time high. Processor demand for apples will not be met in the 1973-74 marketing year.

With fresh market apple supplies in British Columbia very large, orderly marketing is essential during the 1973-74 marketing year. The lack of sufficient transportation has had some adverse effect, early in the year, on the movement of apples to market and may continue to disrupt the orderly flow to market throughout the year.

Fresh apple imports during the period September 1 to December 31, 1973 were 30.5 percent above year-earlier levels. Processed apple product imports may also increase during the 1973-74 marketing year.

Fresh apple exports during the period September 1 to December 31, 1973 were 8.9 percent below the same period in 1972. It is expected that total apple exports during 1973-74 may approach the 1972-73 level. Exports from British Columbia and Nova Scotia in 1973-74 will increase appreciably above the 1972-73 level. Exports from Quebec and Ontario, however, will drop sharply, reflecting the very short crop in the two provinces.

Fresh market prices started the 1973-74 season at a higher level than in the previous year. They will remain above the previous year's level, but will not escalate as rapidly. Processed apple product prices will rise sharply during the year, reflecting record high raw product prices and tight supplies.

A strong demand and high price levels, especially for processing apples, will extend into the 1974-75 marketing year.

OTHER FRUIT

Tender Tree Fruit

The total aggregate production of tender tree fruit (apricots, sweet and sour cherries, peaches, plums and prunes) in 1973 is estimated to total 231 million pounds, 1.3 percent below 1972 and 4.4 percent below the 1966-70 average. The decrease in total production was due to lower production levels of sour cherries (down 38 percent), plums and prunes (down 6.6 percent) and pears (down 27.3 percent). However, apricot production increased 13.3 percent, sweet cherry production 44.1 percent and peach production 25.9 percent.

Although the total Canadian pear crop is 27.3 percent below the previous year the crop in British Columbia is 14 percent above 1972. The increase in production in that province is in the winter pear varieties which are marketed during the winter months. Cold storage holdings of fresh pears on January 1, 1974 in British Columbia were 183.6 percent above the same date in 1973 while total Canadian holdings were 43.3 percent above.

Prices of fresh pears are generally above year-earlier levels and will continue at a fairly high level. However, due to the regional imbalance of storage holdings, transportation problems could greatly influence the available supply, and therefore, price of the product in major market areas.

Stocks of processed tender fruits at the beginning of the marketing year, July 1, 1973, were generally at very low levels. With total production of tender fruit slightly below 1972, a very low stock position and only a moderate pack, the available supply of processed fruit in the 1973-74 marketing year will be below that of 1972-73. In general, the demand by processors for fruit for processing was not met in 1973. With a strong consumer demand for all processed fruit products and fairly tight supplies, prices will increase during the 1973-74 marketing year.

Imports of fresh pears during the period September 1 to December 31, 1973 were 92.6 percent above the same period in 1972. Imports of both fresh and processed tender tree fruits will increase in 1973-74. Exports, already at a low level, will decline further.

Prices to growers in 1973 for both fresh market fruit and processing fruit were generally above previous years' levels. With the fairly tight supply situation in the 1973-74 marketing year, demand and prices will remain high extending into the 1974-75 marketing year.

Soft Fruit

Grape production in 1973 is estimated to total about 130 million pounds, 4.2 percent above 1972. Although larger than the previous year, it is not as large as anticipated earlier in the year or as large as the industry had hoped for. With an increasing demand for grapes from the wine industry, the 1973 crop has fallen short of meeting processor needs.

Production of blueberries in 1973 rose to 35.6 million pounds, 34.9 percent above 1972 and 25.5 percent above average. The outlook for blueberries is excellent. A good export market is developing in several European countries in addition to the traditional U.S. markets.

Production of loganberries, and strawberries also increased in 1973 above the production levels of 1972, but were considerably below average. Raspberry production declined, both below 1972 and below average. The demand for strawberries in 1974 will be strong with resulting higher prices and an anticipated increase in production. The production of loganberries will likely continue to decline due to unsatisfactory returns.

Cranberry production in 1973 increased to 10.8 million pounds, 37.4 percent above 1972 and 232.4 percent above the five-year average. Cranberry acreage continues to increase and with improving returns total production will continue its rapid rate of expansion and with a strong demand prices will remain firm into 1974-75.

Beginning inventory stocks of most soft fruits on July 1, 1973 were low. The demand by processors for soft fruit for processing in 1973 was not completely met. Average farm prices for both fresh market fruit and fruit for processing were above the previous year's level.

The export volume of fresh blueberries during the period July 1 to October 31 was 36.2 percent above the same period in 1972 while total value increased 77 percent. The volume of frozen exports was 1.9 percent above 1972 and total value was up 10 percent. It is anticipated that the export market for blueberries will continue to grow.

Imports of both fresh and processed fruit will increase during the 1973-74 marketing year. The increase in imports will be attributed largely to imports of strawberries, grapes and grape products. With a strong demand for processed products and only a moderate supply, prices will increase during the 1973-74 marketing year. A strong demand and fairly high prices both for processing and for the fresh market, will extend into the 1974-75 marketing year.

POTATOES

The world potato outlook for the 1973-74 marketing year differs from the previous year as production levels in most countries returned to near normal. However, production in the EEC in 1973 was about 6 percent below 1972. Competition for world markets in 1973-74 will be keen for both seed potatoes and table stock.

The 1973 Canadian potato crop is estimated at 46.8 million cwt., 6.6 percent above the 1972 crop, but 10.4 percent below the 1966-70 average. Canadian storage stocks on January 1 totalled only about 19.6 million cwt., 6.9 percent below the same date in 1973.

The U.S. fall potato crop in 1973 is estimated to be 252.0 million cwt., 1 percent above 1972, and 7 percent above average. Storage stocks in the U.S. on January 1, 1974 totalled 128.9 million cwt., 4 percent less than one year earlier. The total Canadian/U.S. supply in the 1973-74 marketing year is 2 percent above the previous year.

Table potato imports during the period September 1 to December 31, 1973 were 23.2 percent below the same period one year ago. Imports of potatoes in the 1973-74 marketing year will likely remain at or slightly below the 1972-73 level. Potato exports in the 1973-74 marketing year will be below last year's level, largely due to improved crops in other regions of the world and increased competition.

Processor utilization in 1973-74 will remain high as will total demand for all uses. In the U.S., 45 percent of the total potato production was utilized for processing in 1972.

Prices at the beginning of the current marketing year began at a level considerably above the 1972-73 starting level. Prices will remain above year-earlier levels, but will not escalate as sharply during the year as they did during the 1972-73 marketing year.

The general outlook for 1974, in light of the current price levels, is for an increase in planted acreage, especially in the western provinces.

OTHER VEGETABLES

Although an official estimate of the 1973 vegetable crop will not be available for several months, indications are that the total aggregate production of vegetables for both fresh market and processing in Canada in 1973 is about equal to the 1966-70 average, 2,729 million pounds, and above the 1972 production level. In Ontario, production of tomatoes, corn and peas for processing was well above average. Aggregate production of the principal vegetable crops in the U.S. was moderately above the previous year. However, tomato production for processing in the U.S. and certain other important countries was at a very low level in 1973. Of current concern is the exceptionally low worldwide stock position of tomato paste.

Storage holdings of onions on January 1, 1974 were 23 percent above the previous year. Storage holdings of fresh cabbage, carrots and rutabagas were also well above the previous year.

Processed vegetable stocks at the beginning of the new crop year, July 1, 1973 were generally at extremely low levels. With only a moderate pack in 1973, current stocks of processed vegetables in both Canada and the U.S. are at fairly low levels. Therefore, total available supplies during the 1973-74 marketing year will be little, if any, above the previous year.

Exports of storable vegetables during the period September 1 to December 31, 1973 were considerably above the same period of the 1972-73 marketing year. Cabbage exports were up 215.7 percent, carrot exports were up 10.9 percent, onion exports were up 58.1 percent while exports of rutabagas were down 9.2 percent. Exports in the 1973-74 marketing year should continue above the previous year's level.

Imports of onions and carrots in the period September 1 to November 30, 1973 were above the same period one year earlier while imports of cabbage were considerably below year-earlier levels. Imports of tomatoes, cauliflower, celery, lettuce and cucumbers were also above the previous year. Imports of fresh vegetables will, in general, be above last year's level of 10.8 million hundredweight.

Processed vegetable imports will increase in the 1973-74 marketing year. It is anticipated that exports of processed vegetables, in the aggregate, will remain fairly stable.

With demand strong for vegetables for both fresh and processing utilization, farm prices in the 1973-74 marketing year have generally been above the previous year's level. Prices for storage crops (onions, carrots, cabbage, rutabagas, beets and parsnips) are generally at or above last year's price levels. They are expected to increase moderately during the marketing year. Prices for most processed vegetable products are expected to increase during the marketing year. With only an anticipated moderate stock carryover into the next year, demand for raw product for processing in the 1974-75 marketing year should be strong with resulting higher farm prices.

HONEY

The 1973 Canadian honey crop, estimated to be 51,834 thousand pounds, is 2.4 percent above 1972 and nearly 14 percent above the 1966 to 1970 average. The total number of colonies was about 3 percent above the previous year. Although production for the country as a whole was above 1972, production in all four western provinces fell.

Demand for honey is strong due to a current worldwide shortage. The Canadian farm price for No. 1 grade (equivalent) honey in 1973 was 50 to 55 cents per pound compared to 30 to 33 cents per pound in 1972. Current prices are about 67 percent above 1972 levels and about triple the five-year average.

The outlook for honey production is not clear. Western Producers must buy package bees each year to establish their producing colonies. The United States, the principal source, has increased the price of package bees to $18, more than double last year's price. Bees are scarce and costs are high. Also, there is some buyer resistance to the higher price of honey this year. This could result in a larger than normal carryover into the 1974-75 marketing year.

MAPLE PRODUCTS

Canadian maple syrup and sugar production in 1973 totalled 2.5 million gallons, 21.1 percent above 1972, and 2.6 percent above the 1966-70 average. Production in Ontario, New Brunswick and Nova Scotia fell considerably below previous years, but the flow in Quebec was 27 percent above 1972.

Producer prices in 1973 for bulk light "A" grade syrup in 1973 were $9.00 to $10.50 per gallon compared with $8.00 to $8.50 in 1972. This is about 57 percent above the 1966-70 average. With a current strong demand for all types of sweeteners, prices will remain relatively high. The general outlook is for a continuing good demand.

ORNAMENTAL HORTICULTURE

The market for ornamental plant materials is expanding rapidly with new markets being created by mass merchandising techniques, especially in the supermarkets. The major factors for achieving continuing growth and expansion in this segment are continuity of supply, variety and price. Paradoxically, under current production technology and production capabilities, this growth trend cannot be sustained without imports.

Floricultural Crops

The world production of floral crops is increasing. This was brought about by greater consumer demand and faster distribution via air cargo. One of the major areas of increasing production is Latin America where production in the various countries of that continent has increased from 50 to 100 percent in the past five years. Exports from these countries to the U.S. have increased more than for any other horticultural product.

The outlook for floriculture in Canada is for a continually expanding market. The cost of production in the coming year, however, will probably increase 25 to 30 percent. The increase will be primarily due to the energy crisis. Heating of greenhouses has represented about 10 percent of production costs and this will increase substantially. The current energy situation will also affect production costs indirectly through a scarcity of plastic used extensively for the manufacture of pots and greenhouse covering.

As a result of the increase in costs of heating, there will be an immediate search for cultivars that can be produced at lower temperatures. It

should be noted, however, that this is a difficult task as many flower crops have specific thermo-thresholds for the initiation and development of flower buds.

Ornamental and Fruit Nursery Stock

The nursery stock segment of ornamentals is also a rapidly expanding market, largely as a result of the concern by architects and homeowners for the quality of the urban environment. Sales in 1973 were at an all time high, but the production base has not been increased to meet the growth in demand. A critical shortage, therefore, in many types of nursery stock is developing. Nurseries in Canada need a greatly enlarged production base more than any other segment of ornamentals.

Turf Grass Sod Production

All evidence points to a continuing rapid increase in the production of turf-grass. Unfortunately, there are no specific data on the volume or value of turf production on a national scale. However, as an indication of the value, shipments from sod farms in Ontario alone totalled $28 million in 1972.

HORTICULTURE — IMPLICATIONS AND ALTERNATIVES

Chas. Bernhardt
President
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Growers' Association

It has been several years since I last had the opportunity of attending the Canadian Agricultural Outlook Conference and this fact possibly permits the ready observation that the subject matter and concerns of this Conference are in marked distinction to the two I previously attended. The Conference theme of "World Food Supply" is aptly chosen and the importance being placed on the economic situation and outlook as a determining factor in securing the supply is in realistic and commendable contrast to the impressions left by the Conferences of several years ago when the problems were overproduction and under-consumption. There has been a considerable, and in some cases a drastic change in the situation and outlook and we as producers earnestly hope that our present hindsight will greatly assist our vision in planning for the present and the future.

The Outlook papers on horticultural crops accurately summarize the situation and indicate to us a number of major problem areas existing in the production and marketing of perishable products in Canada. This is further illustrated in the growing reliance on imports to supply our domestic needs. Canada presently has the productive capacity to supply more of our own requirement and in addition to supply both fresh and processed product for export.

Some of the problem areas have been studied several times over a number of years. Our industry can not survive on studies. Solutions are urgently needed to reverse the serious declining trend in some of our production. It must be accepted that the problems of the horticultural industry in Canada embrace many inter-dependent factors that require a broad and thorough approach for the development of solutions. Temporary, expedient, isolated ad hoc measures will fail to have any effect in ensuring the continuity of supply.

Our geographical position, and the consequent climatic influences immediately places us at a disadvantage in economic and marketing performance. This disadvantage makes tariff protection mandatory. An examination of the record will establish that the horticultural industry is most deficient in protection. An extensive, historical documentation of this is provided in the submission of the Canadian Horticultural Council to the Tariff Board on Reference No. 152, dated November 20, 1973.

Our fruit and vegetable products which have a short storage life have been placed in the most jeopardy by lack of protection and declining production indicates they will be the first to disappear. In recent years, this has placed the processing industry in a serious circumstance.

The combination of declining production in highly perishable products while domestic needs are increasing forces the processor to compete with the fresh market for supplies. All too often they are unsuccessful and are forced, belatedly, to turn to importation of their supplies. A viable tender fruit and vegetable industry in Canada requires the processing outlet. The opportunity and challenge to develop and secure the future of this sector is immediate, but if delayed will be lost to us for all time. Lending to this urgency is the fact that these products are grown in areas where the climate and soil is most favourable. These same factors attract urban development and the more desirable areas have experienced grave inroads in this irreplaceable land resource. Land use policies accompanied by economic policies must seek to arrest this trend.

The recent action of our Federal Government in providing assistance for the construction of facilities for storable agricultural products will enhance our ability to supply our market over the long term. Such measures, together with amendments to stabilization programs that reflect current needs realistically, will do much to secure the production of food for our needs. It is increasingly evident that in order to ensure adequate production of food, and to provide fair returns to the producers for doing so, planning must involve Government and the participation of producers by consultation with them. The encouragement of domestic production is justified for two very sound reasons. One is the uncertainty and risk of relying on foreign countries to supply our needs. In times of crop failures or energy crisis we would have no priority on available supplies. The second is that domestic production retains the economic benefit in Canada both at the primary and secondary enterprise levels.

The matter of farm labour is an acute problem in horticultural crops where the demand is seasonal and experience is required for proficiency. Adding to the problem are the traditionally low rates of pay imposed by the fact that we have been a two-dollar industry in a five-dollar economy. We are concerned too that not sufficient young people are willing or able to take up farming because conditions have been discouraging and capital requirements prohibitive.

Prices and costs are always of paramount concern even under normal, more stable circumstances. An imbalance has developed during this past year in the cost of inputs which creates serious difficulties and stresses the need for cost efficiences. While it is expected that wholesale/retail prices will increase moderately over 1973 price levels, the rate of price increases, particularly food, is expected to moderate this coming year. The production volume, will of course, affect price very greatly.

In the Outlook paper prepared by Mr. T. Bennett, there is no mention of costs. It may be that costs are not dealt with in such a paper, but I feel that it is of extreme importance at this point in time. The farm input costs, as well as marketing production costs are escalating rapidly. Costs, in fact, have to be the most serious concern of the future. The ability to exist economically, considering rapid rises in costs at all levels, will be the major test in future years. There is an urgent need to modernize many of our methods and facilities so that we can automate

and institute material handling and cost efficiences in warehouses, packing lines, storages, containers, bins, pallets, etc. Marketing, as such, is not the problem - lack of cost efficiency is. Farming is no longer just a way of life, but a business which needs profits to survive.

Transportation is very important to us. We are going to need more and better facilities provided to us in the way of rail and truck and also in containers. It is important that we get maximum utilization of trucks and rail cars as shortage of equipment and the energy crisis leave us no alternative. Supplies going to market must be managed properly if we are to maximize returns and obtain these efficiencies.

In the foregoing I have referred to some of the major concerns we have in regard to the well-being of our industry both in the present and the future. The world shortage of food should be added cause for us to take these concerns seriously. We must at all costs avoid the dominance of our industry by imports. Supply and demand forces alone, particularly when the supply factors are influenced so predominantly by imports, cannot be allowed to set market price levels. The cost of production factor must be recognized and accepted. The alternative to not providing the security needed to encourage domestic production would be a greater dependence on foreign imports to supply our needs. The concern for adequate food supplies at stable prices presents this challenge and opportunity to us.

SPECIAL CROPS OUTLOOK

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Economics Branch
Agriculture Canada

A.J. deLeeuw
Economics Branch
Agriculture Canada

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Director, Plant Products Division
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DRY BEANS

The demand for all types of dry beans is expected to remain strong for the next year or more. The current market outlook for 1974 indicates that there is a market potential for production from at least 150,000 acres.

Due to strong world demand and low world supplies, white bean prices are expected to remain firm in early 1974. As a result, producer returns from the 1973 crop will be around $25.00 per hundredweight compared to the average return of $9.15 per hundredweight in Ontario in 1972.

FABA BEANS

The 1974 acreage of faba beans on the Prairies will likely exceed 50,000 acres with a slight expansion in Eastern Canada as well. It is expected that a larger percentage of the 1974 production will be used or sold as animal feed at prices which relate to soybean meal.

DRY PEAS

Demand for the 1973 crop has increased prices substantially and demand for the 1974 crop is also expected to remain strong. Contract prices in 1974 should reflect current market price trends.

Acreage is expected to increase in both the United States and Canada. Although acreage increases of dry peas will be dependent on expected returns from other cropping alternatives on the Prairies, total acreage could approach 95,000 acres.

BUCKWHEAT

Due to other cropping opportunities, higher contract prices will be needed to provide the necessary incentives to producers in Western Canada to meet customer demands for buckwheat in 1974-75.

Demand for the 1973 crop of buckwheat is good. However, exports will be down due to the lack of adequate supplies to meet the demand. Demand is sufficient to handle an increase of 10,000 acres in Western Canada in 1974. Total acreage in Canada is expected to be about 100,000 acres.

MUSTARD

Contract prices in 1974 in Western Canada are expected to reflect the strong demand for mustard seed. Acreage in 1974 is expected to be maintained at 335,000 acres and production could increase if yields return to previous levels.

SEEDS

Seed supplies of most of the principal crops used for forage will be sufficient to meet normal domestic demand. Timothy supplies will be sufficient to meet the domestic and export demand and imports will be lower. Supplies of those crops which are produced mainly for export, such as alsike clover, single-cut red clover and sweet clover, are lower than last year. Creeping red fescue supplies will be adequate to meet expected demand. There will be an adequate supply of meadow fescue available this year. Retail price and thus farm prices for most forage seeds in 1974 are expected to be higher than last year.

Current export sales for forage seeds is generally weaker than a year ago. If this trend continues, there is a strong possibility that total exports in 1973-74 may decrease slightly. Imports of forage seeds are stronger than last year at this time and total volume in 1973-74 could equal the level of last year. Exports of cereal seeds are currently below those of last year and are not expected to increase over last year.

TOBACCO

The total exports of Ontario flue-cured leaf are expected to total about 100 million pounds for the 1973 crop. Sales of flue-cured tobacco in 1973-1974 to the U.K. will only amount to 60 percent of total exports as compared to 80-90 percent in previous years. In its efforts to diversify markets the Ontario Flue-cured Tobacco Growers' Marketing Board (OFTGMB) is currently trying to improve and enlarge markets in the People's Republic of China, Japan, Italy, Libya and Norway.

Negotiations with the Tobacco Advisory Committee of the United Kingdom resulted in the 1973 and 1974 import targets for Canadian tobacco being set at 68.5 and 60.5 million pounds (farm sales weight) respectively, and an additional three million pounds per year will be imported on behalf of associated companies in other countries. The 1974 U.K. import target of 63.5 million pounds is subject to revision in early 1974. Canadian manufacturers are currently expected to take 160 million pounds (farm sales weight) of Ontario leaf for domestic use.

The average producer price for all sales from the 1973 flue-cured crop in Canada could approach last year's level of 77.46 cents per pound. As of January 28, 1974 the Auction sales weight totalled 121.4 million pounds or about 51 percent of the 1973 crop. The Ontario auction price for the top ten grades has averaged 4.2 cents below last year and are averaging 81.48 cents per pound compared to 85.69 cents last year. The prices for the 1973 crop of Quebec and Maritimes tobacco are expected to be closely related to the Ontario auction price.

The agreement between the Marketing Board and the domestic manufacturers including the Tobacco Advisory Committee of Britain extends into the 1974 Ontario crop. It calls for a supply of at least 250 million pounds with minimum guaranteed price to be negotiated between the OFTGMB and the Council taking into consideration recent cost of production estimates and world market prices for flue-cured tobacco. In Ontario, the acreage allotment for 1974 will be set by the OFTGMB and is expected to be the same as in 1973. Flue-cured acreage in Quebec is expected to continue the moderate uptrend of recent years. The Maritimes flue-cured acreage will remain about the same as in 1973. The Nova Scotia Tobacco Marketing Board and the Prince Edward Island Tobacco Marketing Board are presently negotiating with the Tobacco Manufacturers Council for the 1974 crop and anticipate pricing to be highly correlated with tobacco quality.

Acreages of cigar filler and burley tobaccos in 1974 could increase slightly from the 1973 levels. However, increased acreages are dependent upon better prices being offered to offset increases in production costs.

The 1974 sales of domestically produced cigarettes are expected to be about 55.3 billion units, about 2 percent more than in 1973. The 1974 sales of cigars are expected to reach the 1971 level of about 620 million units. Pipe tobaccos continue to represent a relatively small proportion of the total Canadian tobacco products industry.

SUGAR BEETS

The present tight world sugar supply/demand situation is expected to ease in late 1974. Various estimates of world sugar indicate that production is expected to exceed consumption at present prices.

The returns to Canadian sugar beet producers in 1973-74 are expected to be higher than in the previous crop year. Prices of raw world cane sugar are expected to average as high or higher than the former supply commitment price of 7.60 U.S. cents per pound (basis 96 degrees polarization, f.o.b.s. Carribean in bulk). Because of the inability of exporters and importers to agree on a new International Sugar Agreement with economic provisions, quantity and price controls were removed, and therefore, supply commitment provisions were no longer applicable as of January 1, 1974. Raw cane sugar prices are expected to remain high during the first part of 1974, but are expected to drop by the end of 1974.

Transportation costs are another important element. If transportation costs continue to rise then the degree of geographical protection for Canadian beet growers will increase. Returns of beet growers are directly linked to raw cane sugar prices; thus as the landed cost of raw cane sugar increases so will returns to Canadian sugar beet growers. If the unavailability of bunker fuel for ships curtails shipments of raw cane sugar to Canadian cane refineries, then the resulting reduction in the production of refined cane sugar could be expected to increase the prices for refined sugar from Canadian beets.

Total sugar production in the Prairie provinces from the 1973 crop is expected to meet normal regional consumption levels. Refined beet sugar inventory levels were reduced in both Alberta and Manitoba. Production from the 1973 crop in Alberta is expected to be large enough to provide for a normal carryover. However, in Manitoba, the 1973 production is not expected to provide for a normal carryover because of a smaller planted acreage, and lower than average sugar content per ton of beets. Therefore, contracted sugar beet acreage levels for the coming year in Alberta are expected to approximate the 1973 level of 43,000 acres; but in Manitoba acreage is expected to increase from 28,000 acres to over 30,000 acres. High return expectations by producers for alternative production possibilities may reduce these acreage levels slightly if some of the producers switch all or part of their sugar beet acreage to these alternatives. In Quebec there are efforts to increase sugar beet acreage so that the refinery may operate more efficiently and allow higher returns per ton of sugar beets.

The Minister of Finance tabled a Notice of Ways and Means Motion on January 10, 1974, which included a proposal that "tariff reductions on sugar and related products, which were based on recommendations by the Tariff Board, ... be extended until June 30, 1976. It was the Government's view that Parliament should be asked to continue the reduced rates on these items during the present period of high prices and until the nature of the new international economic arrangements dealing with the trade in sugar between producing and importing countries becomes clearer. The tariff structure would be reviewed in two years time in the light of the situation as it develops".[1/]

[1/] Finance Release, p. 2, January 10, 1974.

OUTLOOK FOR CANADIAN FARM INCOME LEVELS

W.L. Porteous
Director, Agriculture Division
Statistics Canada

I am always very pleased to have the opportunity to present one of the final papers of the Canadian Agricultural Outlook Conference. This year it gives me particular pleasure as I am able to say that for Canadian farmers 1973 was a relatively good year and, in general, 1974 should be even better.

Preliminary estimates for 1973 indicate that realized net farm income has increased to a record level of almost three billion dollars, which is a gain of more than 800 million dollars. Total net income, which includes a value for change in inventories, is estimated to have increased in 1973 to more than 3.3 billion dollars.

As suggested in the commodity papers presented during the past two days, gross returns were higher for most commodities during 1973. Total cash receipts from the sale of agricultural products are presently estimated to have reached a record level of 6.9 billion dollars, 27.7 percent higher than in 1972. In absolute terms, receipts from livestock and animal products increased approximately one billion dollars, while crop receipts increased 734 million dollars.

Increases in cash receipts were apparent in all regions of Canada and ranged from 21.5 percent in Quebec to 68.1 percent in Prince Edward Island. Higher potato prices resulted in an improved income from crops for Prince Edward Island and New Brunswick. All provinces benefited from higher prices for cattle and calves, hogs, poultry and eggs. The income position of the Prairie Provinces improved even further during the latter part of 1973 when farmers received a final 1972-73 Canadian Wheat Board payment of 374 million dollars. Ontario and Quebec showed the smallest percentage gains in cash receipts. Dairy and tobacco receipts rose less than most other commodities, while soybean marketings were lower in 1973 than in 1972.

On the other side of the ledger, the upward trend in farm operating expenses and depreciation charges accelerated in 1973 to attain a level estimated at 4.5 billion dollars, some 18 percent above 1972. Substantial increases were recorded for most expense items. Rising prices for grains and for land contributed to sharp increases in share and cash rent, particularly in the Prairie Provinces. In percentage terms, the greatest increase occurred for commercially purchased feed where a 58 percent rise is

estimated for 1973. This increase is partly associated with advances in prices of feed grains. Fertilizer expenses rose sharply, particularly in the Western Provinces where farmers' purchases of this input expanded significantly. Other crop expenses also showed substantialgains. Taxes rose in all provinces except Ontario where the tax rebate program was changed.

Forecasting is always an extremely hazardous occupation. In the present situation, where market conditions are changing rapidly, it is even more difficult. However, based on what we believe to be the best available information, realized net income is forecast to increase further in 1974 to reach an all time high of 4.6 billion dollars. A provincial breakdown is even more difficult, but I think we can state with some confidence that, in the context of net farm income, 1974 should be a very good year for prairie farmers.

For the 1974 Cash Receipt Forecasts the major assumptions are:

1. Canadian Wheat Board initial payments will remain at or near 1973-74 levels.

2. 1973-74 final payments for wheat, oats and barley will be paid before the end of 1974.

3. Deferred income from the sale of grain will be higher in 1974 than in 1973.

4. North American demand for meats will remain at a similar level to that of 1973.

Bearing these assumptions in mind, present indications are that farm cash receipts in 1974 should increase to approximately nine billion dollars. Such an expansion in cash receipts would reflect primarily strong world grain prices. Obviously, the major beneficiaries of these higher prices will be the Prairie Provinces. A much smaller increase is expected in the income from livestock and livestock products.

Continued tight supplies and rising prices will increase farm expenditures in 1974. The effects of recent rounds of price increases of petroleum products are expected to result in a substantial rise in operating expenses for farm machinery. Rising costs of energy, labour and raw materials will certainly increase the prices paid by farmers for other inputs.

As a result of such increases in costs of production, farm operating expenses and depreciation charges are forecast to exceed five billion dollars in 1974.

For most farmers, the farm operation provides only part of their total income. In statistics Canada, to obtain a complete picture of total income we have become interested in measuring farmers' income from non-farm sources.

For the remainder of this talk I wish to describe some of the income relationships which existed in the Canadian farming industry in 1971. The sources of this information is that used by the Department of National Revenue to publish their "Green Book"[1/] as it is popularly known. The unit of observation is all individual taxfilers who reported income from farming on their tax returns. These do not necessarily coincide with a census farm and no attempt was made to reconcile the two concepts.

Furthermore, the concept of net farm income which encompasses the regulations and interpretations allowed under the Income Tax Act does not match completely the concepts used by Statistics Canada to produce the series on Realized Net and Net Farm Income. No attempt is made to reconcile these differences.

The Canada distribution of net incomes (farm, off-farm and total) as related to gross farm income classes presented in Chart 1 points out a number of interesting relationships. First, the highest levels of off-farm income were earned by farm taxfilers associated with the lower ranges of farm gross income. Although this relationship was predictable, the interesting point is that once off-farm income reached a minimum level approximating $1,300 this type of income tended to remain fairly constant despite increasing net farm income. Second, total net income actually declined in the early phases of farm gross income expansion. It would appear that, for farm gross incomes up to about $7,500, net farm income was increasing at a lesser rate than off-farm income was decreasing. It can be observed from the chart that there was an inverse relationship between net farm income and off-farm income at lower levels of farm gross income. In this farm gross income range, the effect of declining off-farm income was the stronger of the two components of total net income. Once a level approximating $7,500 farm gross income was reached, total net income began to increase as a result of the additive effect of increasing net farm income and the levelling off of net off-farm income. At this point, total net income was lowest.

Chart 2 illustrates the percentage distribution of farm taxfilers in Canada by farm gross income. Approximately 62 percent of all farm taxfilers reported less than $10,000 farm gross income during 1971 and, within this range, average net off-farm income exceeded net farm income. In fact, not until gross farm income surpassed $10,000 was net farm income greater than net off-farm income. In general, the tax data for 1971 indicates that the total income position for farm taxfilers with gross farm incomes of less than $10,000 was likely affected more by general employment and salary conditions than by conditions prevailing specifically with the agricultural sector. The converse, of course, was true for farm taxfilers earning gross farm income of $10,000 or more.

Chart 3 presents the distribution of net income by age of farm taxfilers. The chart shows that average net farm income reached its highest level in the 50 to 54 age interval, whereas net off-farm income attained its

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1/ "Taxation Statistics", Department of National Revenue, Taxation.

highest level in the 35 to 39 interval. Thus, the younger taxfilers received a higher proportion of their total net income from non-farm sources than did the older individuals. The rise in off-farm income after the age of 60 was largely a result of pension income.

From the distribution of numbers of farm taxfilers by age in Chart 4, it can be observed that only 27 percent were under 40 years of age, while 49 percent were over the age of 50.

Finally, I should caution against drawing many conclusions on the basis of only the 1971 data. For example, Canadian net farm income doubled between 1971 and 1973 and, as mentioned earlier in the paper, it is forecast to increase again in 1974.

Chart – 1

Distribution of Average Net Farm Income, Average Net Off-farm Income and Average Total Net Income by Gross Farm Income, Canada, 1971.

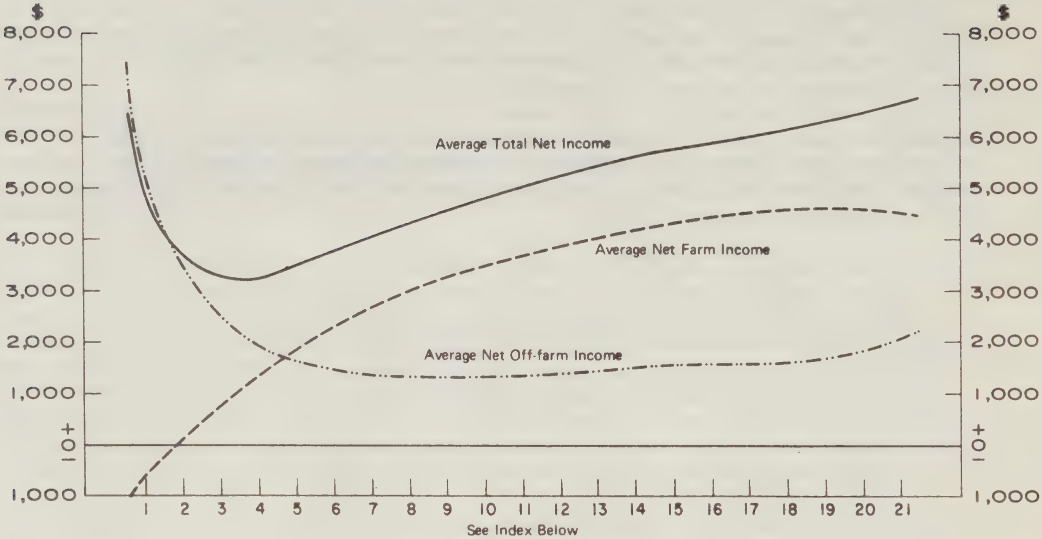
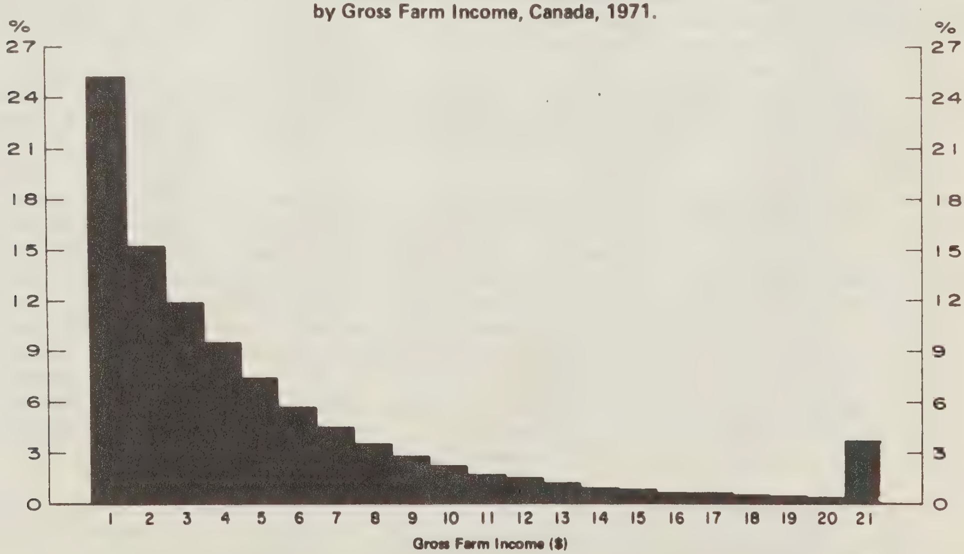


Chart – 2

Distribution of Farm Taxfilers by Gross Farm Income, Canada, 1971.



1 -- 1 – 2,499
2 -- 2,500 – 4,999
3 -- 5,000 – 7,499
4 -- 7,500 – 9,999
5 -- 10,000 – 12,499
6 -- 12,500 – 14,999
7 -- 15,000 – 17,499
8 -- 17,500 – 19,999
9 -- 20,000 – 22,499
10 -- 22,500 – 24,999
11 -- 25,000 – 27,499
12 -- 27,500 – 29,999
13 -- 30,000 – 32,499
14 -- 32,500 – 34,999
15 -- 35,000 37,499
16 -- 37,500 – 39,999
17 -- 40,000 – 42,499
18 -- 42,500 – 44,999
19 -- 45,000 – 47,499
20 -- 47,500 – 49,999
21 -- 50,000 +

Chart – 3

Distribution of Average Net Farm Income, Average Net Off-farm Income and Average Total Net Income by Age of Farm Taxfilers, Canada, 1971

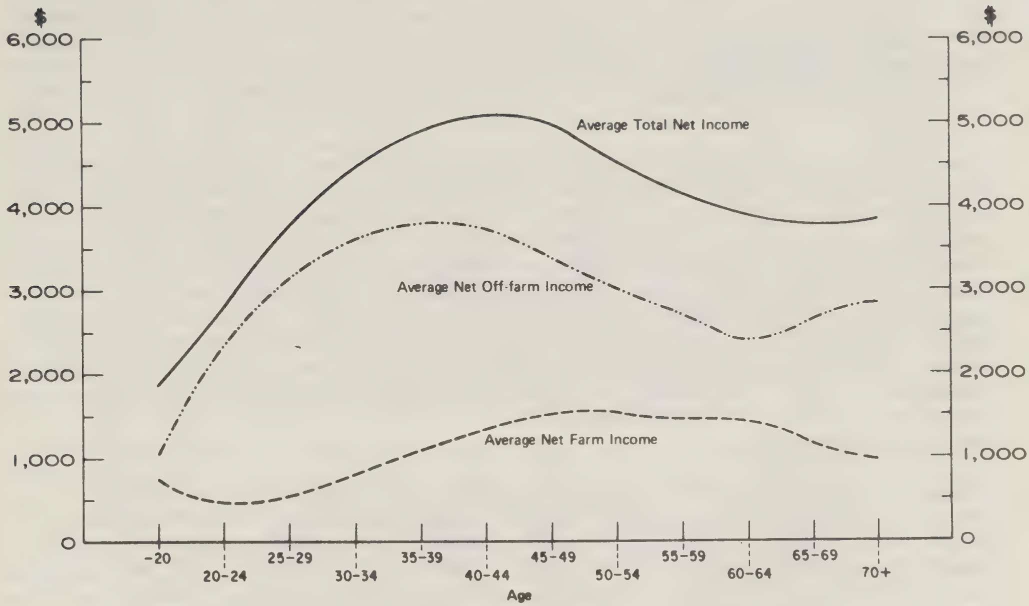
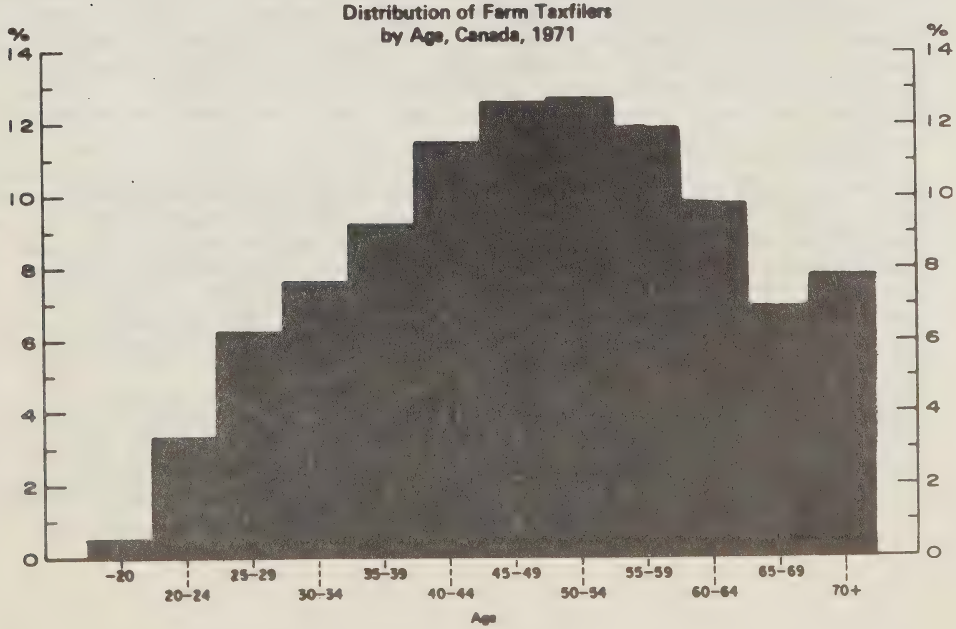


Chart – 4

Distribution of Farm Taxfilers by Age, Canada, 1971



CANADIAN FARM INCOME LEVELS — IMPLICATIONS AND ALTERNATIVES

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Canadian agriculture has just passed through 1973 which has been the most unusual year ever experienced. Unprecedented and unpredicted, it was a complete surprise to everyone. In fact, if it hadn't actually happened one would say it was unbelievable and now, even though from the vantage point of hindsight one can look back and explain it, the task of the forecaster is more uncertain than ever. Therefore, I'm going to accept the income projections with very little challenge because I think there are more important questions to which we must address ourselves, regardless of whether farm income goes up, down, or sideways in 1974. In general I think most people will agree with the broad outline of the income projections. It is the implications which merit our concern.

However, before passing to the implications allow me one reservation about the projections. If 1973 was mind-boggling, 1974 is projected to be even more so. That is, net farm income is expected to show a greater increase (53.5 percent) in 1974 than it did in 1973 (39.2 percent), which is a bit hard to accept. This extremely large increase is said to be made up of two components. One is that the increase in realized gross income will be much greater in 1974 over that shown in 1973. The other is that operating expenses and depreciation will climb by only 10.8 percent in 1974 compared with 18.6 percent in 1973. I must confess I have reservations about this projected halving of the rate of farm costs escalation in the coming year. In 1974, I believe there is going to be almost irresistable incentives to apply more inputs. This, together with their higher prices, may well result in a rate of increase exceeding that of last year.

One of the main implication of events of 1973 and those forecast for 1974 is that nothing has happened to mitigate the boom and bust or "roller coaster" economy in agriculture. After several decades of policy-making the big problems are still with us. For example in the five years, 1955-60, the average annual change, up or down, in realized net income over the previous year was 10.3 percent. In the period, 1961-65, it was 10.0 percent, and in the period, 1966-70, it was 10.2 percent. This was bad enough, but suddenly in the period, 1971-73, and in 1974 as projected, the average annual change works out to 36.4 percent. The strain on an industry of such changes is difficult to bear without severe repercussions. It should also be remembered that these figures are for the Canadian aggregate. Variability within regions, or by commodities, is greater in many cases (for example, in Saskatchewan the annual variability was about double the Canadian figure).

A second implication is that the fantastic increases in the past year, and probably also in the 1974 projections, will surely increase the farmer's vulnerability. As he moves up to higher and higher price levels his cost commitments, locked in a fairly rigid upward trend, place his whole operation in jeopardy if and when product prices slip, which they are almost certain to do. Over the years, the proportion that operating and depreciation charges were of realized gross income gradually moved up from about 60 percent in the middle 1950's, to 70 percent in the period 1968 to 1971. But in the last two years of phenomenal markets it has fallen back to where we would like to see it, that is 60 percent in 1973. The reason of course is that product prices rose so phenomenally in 1973. But where will it be when product prices slip sooner or later and costs have remained at the higher levels, or continued to increase? Prices would not need to fall all that far for the proportion of costs to exceed 70 or 80 percent on an aggregate basis. For many individual farmers with high priced fixed commitments the result would be financial ruin. Land values are escalating, machinery prices are rising rapidly, and the energy crisis will probably add to price increases in other inputs. I heard recently of a farmer in Saskatchewan who bought a second hand tractor and had to pay more than when it was new six years ago.

A third implication is that the present boom is doing nothing to reduce the income gap within agriculture, that is the gap between rich and poor. In the present situation the larger farmer is in the stronger position once again, and better able to grow still larger. Shown here is a chart of Lorenz curves which indicate the change in income distribution over several recent census years. The chart shows the proportion of total sales sold by certain proportions of total farms. For example, we see that 50 percent of the farms are responsible for only about 10 or 12 percent of all sales of farm products. The important thing to note is that the situation is worsening rather than improving. The more the curved line deviates from the straight diagonal the more distorted the distribution. Unfortunately, no data are available for the present year, but it is not likely that the trend has suddenly changed.

A fourth implication of the present situation is that the downward trend in farm numbers will not likely be stemmed and we can expect the continued erosion of rural communities. It is probably true that more young people are now trying to enter farming, but it is doubtful if this will mean any change in the rate of decline. For the most part, if they gain entry at all, it will be as replacements for older farmers who now find it possible to profitably sell out. However, with existing larger farms in a better capital position consolidation of farms will also be taking place at a faster rate.

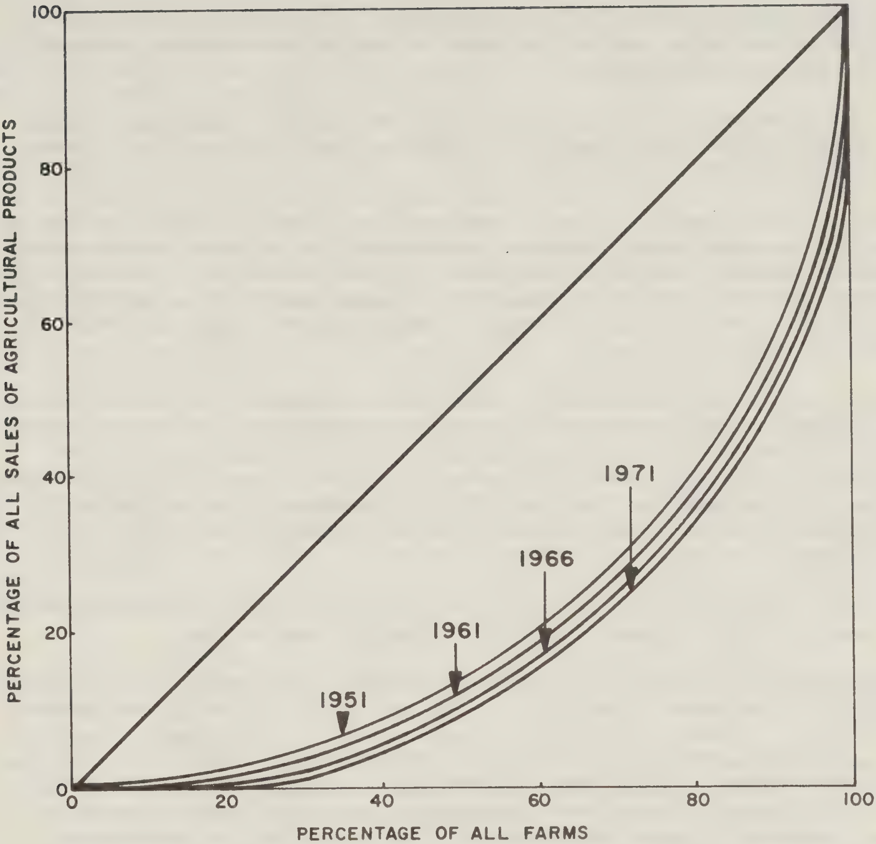
A fifth implication of the current situation is a recognition of the limited usefulness of short run forecasts which sometimes turn out completely wrong through nobody's particular fault, because of various world events which can be totally unpredictable. The most important farm decisions are perhaps not whether to sow more barley or less wheat, but whether to buy land, or purchase a large tractor. The industry needs to know more about

longer run projections. Are we indeed on a new plateau where resources are strained to the utmost to produce enough and prices will remain high or whether there will be a bust after the current boom.

Forecasting seems only possible where the major variables are known within certain bounds. But the time when we really need forecasts are when gross changes occur and these are the very times when we can't predict them. Still, I suppose we must go on trying and some information is better than none, even if we know that occasionally at unknown times it will be very wrong.

In summary, we may say that the present situation in January, 1974 has a number of implications. Farmers still have a boom and bust type of industry, their farm businesses are becoming more and more vulnerable with rising costs and capital commitments, the distribution of income between farms is not improving, numbers of farms are becoming fewer, and many of the most vital matters concerning them are still unpredictable.

The industry would seem to need some kind of stabilization, but what kind? If yields and markets are inherently unstable the best that can be hoped for is that they be somewhat predictable actuarially. We would not want to stabilize things to the point where the industry couldn't respond to changing conditions of yields and markets. On the face of it, one is led logically to policies based on the insurance principle on the producers side (either yield or income) and the storage principle on the user's or consumer's side. It remains to be seen whether policies can be designed that will receive acceptance by these groups.



Lorenz Curve of Farm Income Distribution in Canada for Several Census Years

CLOSING REMARKS

Hon. Eugene Whelan
Minister
Agriculture Canada

This has certainly been the most successful Outlook Conference in our history, if we judge success in terms of the volume of paper produced and in terms of enthusiasm.

But those are not the terms that I think we should be applying to judge the success of this Conference. I think we should be using a different yardstick.

First, I think we should use the yardstick of clarity. How clear are the positions we have taken? Have we done a good job of saying what we feel about the Outlook for the coming year? If not, how can we possibly expect farmers and the agricultural industry to understand what we are trying to say, and how can we possibly expect to make realistic decisions for the coming year?

Second, are we doing our best to move this information to the people who will translate it into action? Surely this Conference is, above all, a place to provide farmers and agribusiness with information, and that information is only useful if it moves out to the farmers and agribusiness leaders of this nation. They are the people who will be putting this information into use, making production and marketing decisions for the coming year.

How well do you feel this Conference has measured up to those yardsticks? Personally, I think there is a lot of room for improvement.

There is a common thread that has run through all of the presentations during this Conference, and that is the fact that 1974 will be a year of uncertainty. There is uncertainty, not so much at the present time, but in the medium and long term. I have in mind policies that will allow us to deal, in some measure, with uncertainties through government policies. But also through the very use of marketing customs of other countries, other products or other industries -- I am pleased to see contractual arrangements have been mentioned at this Conference as one such means of dealing with the problem. There is a need for stability in agriculture, and the need is greater today than at any time in recent history. As Minister of Agriculture, I accept the challenge to develop practical and workable price and income stabilization programs for agriculture.

I will be meeting with the provincial ministers of agriculture tomorrow, and one of the priority items on our agenda is price and income stabilization programs for Canadian agriculture. It is important that we, as ministers of agriculture, work together to develop these programs and

policies. But I also believe that it is equally important that we work with farmers and the leaders of farm organizations. I fully intend to consult them in the development of price and income stabilization programs and policies.

The conflict between feed grain producers and users is clearly evident from the papers presented and the discussions held. In periods of surplus grains, profits tend to go to the livestock man. The reverse occurs in periods of grain shortages. The profits then tend to go to the grain man. We must find some way, some system of keeping the benefits in the middle of the road as much as possible.

There has been a lot of concern expressed about transportation shortages and the further uncertainty this adds. Meeting our needs in this area is just one of several things we are supervising closely. We are watching energy supplies, fertilizer supplies, equipment supplies, steel production, agricultural chemical stocks and international markets. All of these factors can swing next year's situation one way or another from our present outlook benchmarks, depending on developments that we cannot foresee. The uncertainties in all the areas of supply are worrysome to farmers, even more so than to business associates, who do not have to deal with the uncertainties of climate on top of everything else. But let's keep our transportation problems in perspective. They are one of many areas of challenge that we've faced successfully in the past and we can do the same in the future.

I have been saying that agriculture is in need of special sources of credit to meet the challenge of production. The chairman of the Council, Mr. Raynauld, has hit the nail right on the head when he said, "capital requirements of the agriculture sector will come in conflict with those of other sectors of the economy, particularly those associated with the development of Canadian energy resources.

This will require increased credit facilities and improved management techniques to allow the agriculture sector to face international competition and to develop export markets".

We have heard a call for an international food security program, and for international action and co-operation to produce more food. I agree that the world will need more food. And I agree that Canada is blessed with plenty of land, water, energy and excellent farmers to meet the growing challenge to increase production. But I do not think it is fair to expect Canadian farmers to run an international food aid program, and I do not think it is fair to expect Canadian farmers to continue to pay for holding 30 percent of the world's inventory of wheat. Canadian farmers can and will increase food production, but all Canadians and all international customers have an obligation to provide our farmers with a reasonable, decent income for their efforts and their investment.

In dealing with the various problems before us, we have to assess the benefit of coming together like this, to discuss them the way we are doing. I wish to remind you, this is not a policy meeting, although policy effects can and should be discussed. This meeting is not a gathering to cook up some means of controlling the economy. The task before this meeting is to make as much knowledge as possible available to producers so they can take advantage of opportunities or better meet the problems they must deal with on a daily basis.

In closing, please accept my personal thanks for attending to the job of bringing the information of this Conference - first of all to the farmers, but also to the many finance institutions, industries and marketing agencies that serve Canada's farmers and consumers.

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CANADIAN FARM ECONOMICS

HON. EUGENE WHELAN, MINISTER – S.B. WILLIAMS, DEPUTY-MINISTER

Agriculture Canada dept. Economics branch

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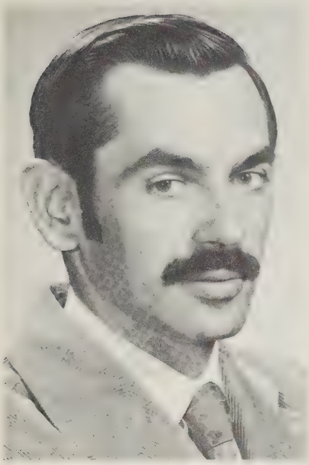
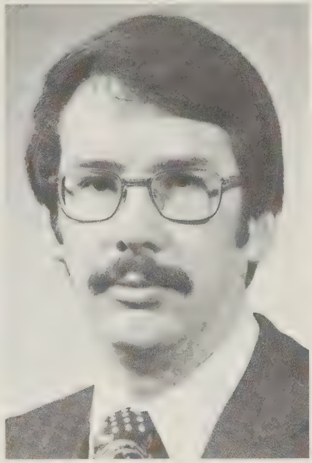
ERRATUM: p. 4 switched with p. 30.

ONTARIO GRAIN CORN MARKETING



Ontario's grain corn production is expected to continue increasing as a result of larger crop yields and acreage. Changes in harvesting technology and marketing methods indicate a continued expansion in field shelling, resulting in a greater need for improved marketing facilities.



R.W. Anderson C.T. Craddock *

INTRODUCTION

Ontario's grain corn industry[1] has recently had a significant expansion of production which has increased the need for improved marketing facilities. This article outlines the changes occurring in the production-marketing system and some of the suggested methods of easing the strain on facilities.

The increase in grain corn production has resulted from a rise in both yield and acreage. Adoption of field shelling which requires artificial drying and aerated storage has been widely adopted as a new technique. The grain combine has reduced field losses and labor requirements and has increased harvesting capacity. This has led to a rapid adoption of the practice of field shelling.

While facilities for conditioning, storing and handling have expanded, growth has been slow and inadequate to handle the increasing volume of shelled corn. Three major factors account for this insufficient expansion of marketing facilities: (1) the physical marketing system requires time to adjust to field shelling; (2) the shift to shelled harvesting has resulted in a larger percentage of the crop being marketed directly from the field; and (3) larger, faster harvesting equipment has speeded up harvesting and shortened the delivery period.

While exact estimates of the lack of handling and conditioning facilities are not available, many elevator operators confirm this inadequacy for receiving and conditioning wet shelled corn as rapidly as it is being harvested and delivered. In fact, many elevators have been forced, particularly in 1971 and 1972, to operate on a three or four-day delivery week or on a half-day delivery schedule to keep daily receipts in line with daily drying capacity. Industry response to this demand for facilities will depend on its analysis of the factors affecting the demand for grain corn and the possible returns on investments.

Corn prices in Ontario vary more within one year than in the United States in both absolute and percentage terms. Over the 1961-72 period, the differences between the low price month and the high price month in Ontario and the United States were 17 cents and 13 cents per bushel respectively. This greater seasonal variation in Ontario is believed to be partly attributed to a shortage, and therefore higher cost, for drying and storage facilities in Ontario.

PRODUCTION

Canadian corn production in 1958 was 29.8 million bushels of which 29.6 million bushels were grown in Ontario (Table 1)[2]. In 1973, 108.9 million bushels were grown with 101.0 million bushels coming from Ontario. Production has levelled off since 1970; however, an

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[1] Ontario produces approximately 90 percent of Canada's grain corn.

[2] Quebec accounts for most of the remaining production increasing from 1.1 million bushels in 1966 to 7.0 million bushels in 1973.

TABLE 1. GRAIN CORN PRODUCTION – ONTARIO (BY REGION), QUEBEC AND CANADA
('000 ACRES AND MILLIONS OF BUSHELS)

	ONTARIO								QUEBEC		CANADA	
	SOUTHERN		WESTERN		CENTRAL		EASTERN					
Year	Acres	Production	Acres	Production	Acres	Production	Acres	Production	Acres	Production	Acres	Production
1958-59	439	26.7	34	2.2	10	.5	4	.2	–	–	494	29.8
1959-60	436	27.9	32	2.1	9	.5	4	.2	–	–	485	30.9
1960-61	458	26.5	35	1.9	8	.4	3	.1	–	–	456	26.1
1961-62	366	27.0	21	1.4	5	.4	4	.2	–	–	400	29.1
1962-63	326	29.7	22	1.6	6	.4	4	.3	–	–	439	33.4
1963-64	471	31.0	51	3.3	19	1.3	7	.5	–	–	553	36.2
1964-65	553	45.5	64	4.9	25	1.8	8	.6	–	–	655	52.8
1965-66	616	50.2	80	6.0	32	2.4	11	.8	–	–	746	59.5
1966-67	658	55.5	85	6.3	33	2.3	10	.7	17.7	1.1	807	66.3
1967-68	705	60.5	96	8.1	34	2.6	15	1.1	20.0	1.6	876	74.1
1968-69	730	62.4	120	10.3	40	3.2	35	2.7	30.0	2.5	958	81.2
1969-70	716	53.1	126	9.8	43	3.3	45	3.6	45.0	3.5	978	73.4
1970-71	813	69.9	158	13.4	64	5.1	65	5.1	93.4	7.3	1,197	100.9
1971-72	813	70.1	231	19.1	85	6.4	83	6.6	138.0	13.2	1,410	115.9
1972-73	806	67.3	242	18.5	87	6.9	30	1.8	114.0	7.6	1,327	99.5
1973-74	779	68.5	253	21.7	87	6.9	56	3.9	95.0	7.0	1,286	108.9

SOURCE: Handbook of Agricultural Statistics D.B.S. 1920-63 Cat. No. 21-507. Crop reporting series D.B.S. 1963-72, Cat. No. 22-002.

increase of approximately 10 percent has been forecast for 1974[3].

Southern Ontario is the major corn producing area within the province, having increased corn acreage from 439,000 in 1958 to 779,000 acres in 1973. The other regions of Ontario have increased acreage from 34,000 to 253,000 acres, from 10,000 to 87,000 acres and from 4,000 to 56,000 acres in Western, Central and Eastern regions respectively[4]. In terms of production, the increase in acreage has resulted in an average annual increase in production of 5.1 percent for the period 1969-73.

Yields in all regions of Ontario have increased from between 33 percent and 39 percent for the period 1958-60 to 1971-73. The 1971-73 average yield was highest in the Southern region at 84.2 bushels per acre followed by Western (81.7), Central (78.2), and Eastern (70.2) regions.

[3] Canada Grains Council: Published in a paper presented to the Corn Conference, Ontario Grain Corn Council, London, Ontario, February 25, 1974.

[4] The 1973 figure for the Eastern region is probably not representative as wet planting conditions reduced the grain corn acreage in that region. In 1971, that region harvested 83,000 acres of grain corn.

UTILIZATION

The use of corn in Canada has increased from 39.9 million bushels in 1955-56 to 115.1 million bushels in 1970-71. In 1970-71 human food and industrial use accounted for 27.4 million bushels, feed manufacturing 31.0 million bushels and on-farm use 56.7 million bushels. Total corn used as feed increased to 91.4 million bushels in 1971-72 (from 87.7 million bushels in 1970-71) of which Ontario accounted for 72.9 million bushels. Quebec is the other major market consuming 15.5 million bushels in 1971-72. On-farm use of corn accounted for 50 percent of total domestic use in 1961-62, 49 percent in 1970-71 and averaged 47 percent for the period 1961-1971.

Ontario's feed grain market, unlike the market in the rest of Canada, is dominated by grain corn. The most extensively used feed grain across Canada in 1971-72 was barley, followed by oats, corn, mixed grain, and wheat. In Ontario, the most extensively used feed grains after corn were mixed grains, oats, barley and wheat. Of the 72.9 million bushels of corn used for livestock feed in Ontario in 1971-72, only 1.2 million bushels were imported from the United States. Ontario is less self-sufficient in total feed grain. In 1971-72, 610,000 tons were imported into Ontario from Western Canada, representing 11.5 percent of the 5.3 million tons used in Ontario for that year. Since 1961-62, Ontario's annual feed grain imports from Western Canada have ranged from a low of 573,000 to a high of 1,032,000 tons.

Industrial use of corn in Canada has increased substantially since 1961. The amount consumed in industrial use has increased from 14.7 million bushels in 1961 to 27.4 million bushels in 1970. Much of this increase occurred in distilling where corn usage rose from 5.8 to 13.2 million bushels. Canadian corn accounted for 39 percent of the corn used for distilling in 1961, but accounted for 62 percent in 1970. Canada's industrial corn industry has depended on high quality imported corn. As Ontario's corn production increases and handling facilities improve, the amount of quality corn is expanding leading to some substitution of imported with domestically grown corn. Despite this improvement, Canada's industrial corn market remains dependent upon imports for part of its supply.

If the trend for the past ten years continues, industrial use of corn in Canada in 1980 would reach 40.7 million bushels, feed manufacturing use of corn would reach 50.2 million bushels, and on-farm use of corn would reach 88.6 million bushels in 1980. The result would be a total demand for corn in 1980 of 171.5 million bushels versus 115.1 million bushels in 1970. The most uncertain of these figures is the 50.2 million bushels that would be used in feed manufacturing. This figure could change (probably on the down side) depending upon the nature of the pricing of Western feed grains into Eastern Canada.

CORN MOVEMENT

Southwestern Ontario is the major surplus corn producing area in Ontario. From here, corn is shipped to Western Ontario (feed), Central Ontario (industrial use), Eastern Ontario (feed), Quebec (feed and industrial use) and the Maritimes (feed).

Corn moves from Southern Ontario to Western Ontario mainly by truck, with a typical cost of 1/10 cent per bushel per mile. The industrial market for corn in Ontario is located on water at the Western end of Lake Ontario. Canadian corn moves to this area by rail and truck and must compete with U.S. corn using water movement. Shipments of corn to Eastern Ontario are by rail which has a negotiated 'water competitive rate'. Quebec markets are supplied by Ontario corn moving by both ship and rail, with rail shipments to this market becoming more frequent. Corn moves to the Maritimes feed market usually by rail and under a subsidy by the Feed Freight Assistance Act. This subsidy ranged between 8.4 cents and 29.1 cents per bushel in 1971-72 depending on location.

Corn exports have fluctuated from a low of 53,000 bushels in 1960 to a high of 84,300 bushels in 1972 (only 86,000 bushels were exported in 1970); 1.6 million bushels of corn in 1971-72 and none in 1972-73 were shipped to the Maritimes.

PRICES

The United States' corn market has a strong influence on the Canadian corn price. The relative sizes of the markets (Canadian corn production is approximately 2 percent of U.S. production) result in the U.S. market having a dominant influence on Canadian prices. Traditionally, Canada has been an importer of U.S. corn and, thus, the U.S. export price plus the cost of movement, the 8-cent tariff, and an allowance for currency exchange rates have been viewed as the benchmark for Canadian prices and also the ceiling price. The lowest price for Canadian corn should be the world export price which would be equivalent to the f.o.b. vessel price of U.S. corn at Montreal (minus handling and transportation costs back to the producer).

Another factor affecting the price level of corn in Eastern Canada is the price level of Western feed grains moved to Eastern Canada. The Canadian Wheat Board has previously sold Western feed grains into the Eastern market at prices usually competitive with U.S. corn at Montreal. For the 1973-74 crop year, Western feed grains are priced into Eastern Canada on the basis of feed lot and feed mill (off-board) prices in Western Canada plus handling and transportation costs (less feed freight assistance). After this year, the Federal Government will introduce a national feed grain policy, the details of which are still being discussed.

Ontario corn producers have received higher prices than their American counterparts, although this spread has narrowed in recent years (Figure 1). Two factors account for most of this Canadian price advantage: (1) imports of U.S. corn are subject to an 8-cent tariff, and thus, if Eastern Canada remains a net importer of corn, producers in Ontario will benefit from this tariff; and (2) transportation costs for Ontario producers are lower due to their closer proximity to some parts of the Canadian market.

Significant seasonal variations in corn prices have occurred in Ontario. Corn sold just after harvesting encounters neither storage costs nor the risk from adverse price changes and would normally be sold at a price reflecting these expected costs by the buyer. The seasonal variation between the low month and the high month in Ontario for the 11-year period 1961-72 has averaged 14.5 percent or 17 cents per bushel. This exceeds an estimate of the storage and elevator costs,

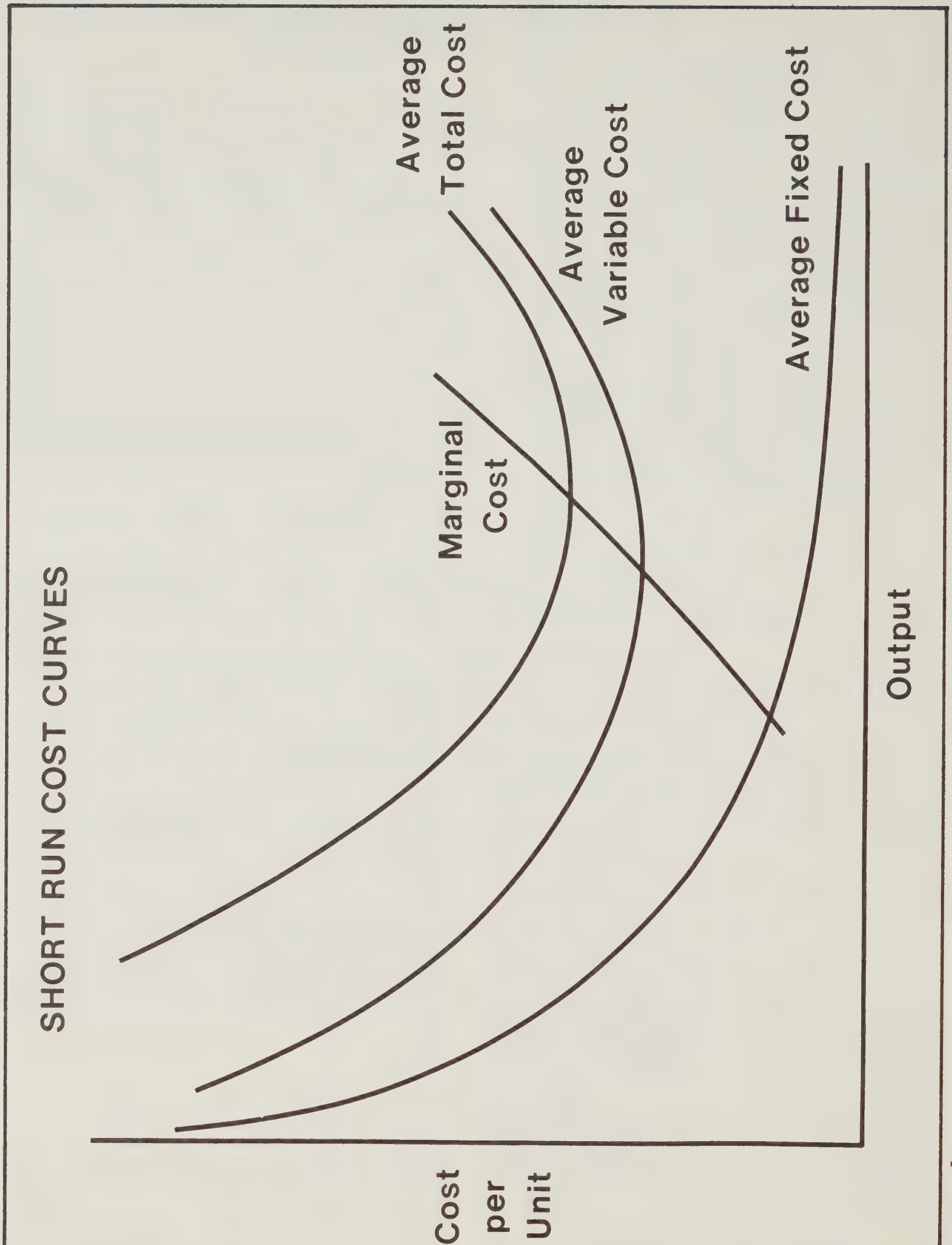
SHORT RUN COST CURVES
Cost per Unit
Output
Marginal Cost
Average Total Cost
Average Variable Cost
Average Fixed Cost

Figure 1

which presumably includes an allowance for the risk of price changes of 11.8 cents per bushel[5]. Much of this difference results from the lack of suitable local marketing facilities to handle the peak harvest quantities. The impact of field shelling on this peak demand and the lack of storage and drying facilities are discussed in the following sections.

ADOPTION OF FIELD SHELLING

Increased yields and acreage plus the recent use of the grain combine in corn harvesting in the late 1960's increased the demand for marketing facilities. With field shelling predominating in new production areas and increasing rapidly in established grain corn production areas, existing marketing facilities were unable to meet the demand. The greatest demand for facilities came in 1970 and 1971 when production increased over that of the previous year by 27 million bushels and 15 million bushels respectively.

Although data are not available for Ontario on the total percentage of the grain corn harvested in the shelled form, enough information is available to suggest that the results of a study on Illinois grain corn production could apply to Ontario[6]. That study found that all parts of Illinois's cash grain corn production area were adopting the shelled harvesting technique at approximately the same rate. Indications are that a similar situation exists in Ontario. The Illinois study also found that less combining occurred in regions with high livestock inventory. This occurs because much of the corn produced in livestock areas is fed directly and there is less incentive to change harvesting techniques. In addition, substantial investments in storage and feeding facilities would discourage a shift to a harvesting technique that would render these facilities obsolete. The Illinois study found, however, that over half of the larger corn producers in livestock areas did some shelled harvesting.

A general conclusion by the Illinois study on field shelling was that two factors determine the percentage of acreage field shelled in an area: (1) the percentage of farms in the country which are specialized cash grain farms; and (2) the average acreage of corn produced per farm. Both conclusions appear consistent with the situation in Ontario.

The percentage of the corn crop shelled at harvest is increasing more slowly, as most growers who will shift have already done so. Most of the increase in the volume of shelled corn at harvest time will now come from increased acreage and yields rather than from a shift from cob to shelled corn harvesting. This annual increase in the volume of shelled corn will be more gradual than that experienced in the late 1960's and early 1970's.

STORAGE REQUIREMENTS

Storage facilities suitable for grain corn are increasing. Annual sales of metal grain storage bins in Ontario rose approximately 165 percent between 1969 and 1972. Storage capacity at the elevator level increased from 6.4 million bushels in 1960 to 20.4 million bushels in 1972. Farm storage, historically used for other grain crops, is often not well suited for the storage of high quality shelled corn.

Production-storage ratios have been declining and indicate improvement in storage availability. In 1966, elevator capacity for all of Ontario was 14.3 million bushels and production of major grains was 204.3 million bushels, yielding a ratio of 14:1. By comparison, a capacity of 20.4 million bushels and production of 219.4 million bushels in 1972 resulted in a ratio of 11:1. On a regional basis, the ratio for Southern Ontario dropped from 7.2 to 5.8, while Western Ontario dropped from 8.2 to 6.8. Meaningful ratios are not available for the two Eastern Ontario regions but indications are that a storage shortage exists in that area.

Recent elevator storage construction appears to be following Ontario corn production. Most of the available elevator storage in 1968 was located in Southern Ontario -- the historical grain corn production area. However, as production escalated in other regions, storage followed. In Southern Ontario, storage capacity increased from 11.3 million bushels in 1968 to 16.3 million bushels in 1972. Storage in Western Ontario for the same period increased from 1.6 to 3.9 million bushels. Central Ontario storage increased from zero to 50,000 bushels, while in Eastern Ontario storage increased from zero to 240,000 bushels. With the increase in storage facilities occurring several years after a production surge, storage construction will likely continue for at least a short period even when production increases at a slower pace.

The decision as to whether new storage should be located on the farm or at the elevator is only partly based on costs. Flexibility of marketing decisions throughout the year, on-farm feeding requirements, receiving and storing capacity of elevators, moisture

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[5] Sorflaten, Allen G., Cost Output Relationships in Ontario Country Grain Elevators, University of Guelph, 1967.

[6] "Trends in Harvesting and Marketing Illinois Corn", L.D. Hill and J.T. Scott, Jr., published in Illinois Business Review, Volume 25, No. 5, May 1968.

Grain Corn Storage

discount rates at harvest and prevailing storage charges are all important factors in the decision. The pattern and concentration of livestock production is changing so that a lower proportion of the total corn fed to livestock will be fed on the farm where it is produced. Specialized livestock farms will buy more corn from specialized corn producing farms through the regular marketing channels. Additional storage and handling facilities will be needed for this farm exchange.

Using capital costs for corn storage facilities, an annual cost per bushel can be estimated. For grain corn steel bins with capacities of approximately 5,500 bushels and 10,500 bushels, the average costs were 8.4 cents/bushel and 9.7 cents/bushel respectively. The cost estimate for the larger bin included aeration and unloading equipment (without these the larger bin would have had lower costs than the smaller bin). For crib stored corn the average cost per bushel was 13.3 cents/bushel based on 2,200 bushel capacity cribs. These storage costs are less than most of the annual price variations from harvest to postharvest. Based on storage cost savings, farmers could benefit financially by storing their corn, but the complicating factor of grain corn drying may remove any savings.

To properly determine whether adequate storage capacity exists, information is needed on whether more corn would be placed in certain types of storage if they were available. At present, available storage and expected construction indicates that for some areas storage supply may be coming in line with storage demand.

DRYING FACILITIES

An expansion in grain corn production in excess of 300 percent since the late 1950's and a major shift in

TABLE 2. ONTARIO GRAIN PRODUCTION AND DRYING CAPACITY

Area or County	Drying Capacity 1972[1] Bushels/Hour	Production (corn, winter wheat, soybeans) level 1972 00's bushels	Production/ Drying Ratio
Southern Ontario	50,175	90,187	1,797
Kent County	23,000	24,031	1,045
Middlesex County	5,900	11,343	1,922
Oxford County	1,600	9,238	5,774
Western Ontario	9,680	20,114	2,078
Central Ontario	0	7,933	∞
Eastern Ontario	800	2,605	3,256
Province	91,155	146,737	1,610

[1] Represents a range of moisture removal including 25.5 – 15.5% and 20.5 – 15.5% for batch dryers.

Source: Drying Capacity – License Applications Under Grain Elevator Storage Act of Ontario.
Production – Agricultural Statistics for Ontario, 1972, Ontario Ministry of Agriculture and Food.

harvesting technology resulted in an increase in the demand for drying facilities which exceeded the apparent capacity available. Historically, much of the grain corn harvested for cash sales was in the cob form which required only natural crib drying. The introduction of shelled-corn harvesting required the use of dryers. In the original corn producing area where grain corn was harvested mainly in the cob form, the switch to shelled corn harvesting was slower than in new corn producing areas which adopted the technique almost exclusively. In Southern Ontario, the original grain corn producing area of the province, shelled corn accounted for 66.5 percent of the harvest in 1968, but had climbed to 76.5 percent just two years later. All other areas of Ontario exceed Southern Ontario in the percentage of corn harvested in the shelled form. Western Ontario, where production is expected to increase by an additional 50 percent by 1980, had 91.2 percent of its 1970 crop harvested in shelled form. As a result, pressure on the drying facilities in the latter area will continue.

The ratio of production to drying capacity varies appreciably among areas in Ontario (Table 2). Although the optimal ratio would depend upon harvesting method, the wide range in ratios suggests that some areas probably lack adequate drying capacity.

Grain corn production in locations where drying facilities appear to be inadequate has been, until recently, very small. Production in these locations has been experimental as growers have not been sure that grain corn can be profitably grown. These same growers adopted the sheller-picker method of harvesting, but did not construct drying facilities, depending instead on commercial units. The high cost of drying facilities and operational expertise required are believed to be two reasons for growers not building their own drying facilities. While the Government programs have been available in these areas, construction of additional drying facilities have been delayed until production possibilities are better known. Although production in locations with inadequate drying facilities increased significantly until 1971, two poor crop years have tempered projections concerning future production. Also, production by those committed to grain corn has levelled off, allowing drying to catch up with demand.

The cost of drying corn on Ontario farms varies with the volume of corn dried and the type of drying equipment used[7]. Continuous type dryers have a cost ranging from 13 to 17 cents per bushel compared with approximately 9 cents per bushel with a batch type dryer. These costs were based on actual farms where grain corn production ranged from 11,000 to 23,000 bushels. The majority of corn producers have insufficient production over which they can distribute the high capital cost of drying equipment. Consequently, most producers seek alternative, more economical means of drying corn.

The major locational alternative for drying corn is at country elevators where costs are considerably lower. Country elevator drying costs in 1970 were 5.6 cents per bushel. Although the farm costs, ranging from 9.0 to 17.0 cents per bushel, were collected in 1966, it is believed that these costs have not declined (likely increased) in that period. Lower drying costs at country elevators is one reason why many farmers deliver directly to the elevator.

In addition to the cost difference, farmers have other reasons for using off-farm drying. On-farm drying and storing requires additional highly specialized labor at

[7] R.F. Heard, et al. "Shelled Corn Handling System", OMAF, Parliament Buildings, Toronto, Ontario.

harvest time when suitable labor is usually in short supply. Capital tied up in drying and storing facilities might yield higher returns if invested elsewhere in the farm operation. If grain corn is not properly dried below 15.5 percent moisture it will not keep, and thus will result in financial losses for the producer. Consequently, if elevators can provide sufficient receiving, drying, and storing facilities at harvest time, at rates comparable with on-farm costs, very little storage and drying can be expected at the farm level.

However, despite the numerous disadvantages of on-farm drying and storage, a number of large farms have constructed their own facilities in an effort to speed up harvesting and overcome inadequate elevator facilities during peak harvest periods.

Moisture levels at harvest, length of harvest season, type of storage available and the existence of farm drying equipment are all factors in determining what level of commercial drying facilities will be needed. Moisture levels and length of harvest season both vary significantly from year-to-year. While farm drying capacity statistics are unavailable, industry sources believe this capacity is increasing and becoming less of a problem in some areas.

STORAGE AND DRYING PROGRAMS

Government programs have been used to encourage both dryer and storage construction. Ontario has used a grant system, while the Federal Government has used an accelerated depreciation scheme. The Federal Government accelerated depreciated program was initiated April 1, 1972. It provides for accelerated capital cost allowances on specified new grain storage and drying facilities. This program is scheduled to continue until August 1, 1974.

Ontario's capital grants program, in operation since 1969, provided $856,892 assistance in 1971-72 (the most active year to date) which resulted in a total estimated capital expenditure of $2,142,230. This investment resulted in over six million additional bushels of storage capacity.

Estimates of the effect of the Federal Government's accelerated depreciation program are unavailable, but indications are that it is being used. This program is scheduled to continue until August 1, 1974.

SUMMARY

Except for a few of the most Southern counties of the Southern Ontario region, grain corn production in Ontario is expected to continue increasing in the foreseeable future. This increase is expected to result from an increase in both yield and acreage. Estimates based on recent trends indicate that by 1980, Ontario's corn producers could plant approximately 1,556,200 acres of grain corn and expect an average yield of 99.8 bushels per acre resulting in production of 155.3 million bushels.

Changes in harvesting technology and marketing methods indicate a continued increase in field shelling. This will result in increased pressure on receiving and conditioning facilities as yields, harvesting capacity, and direct marketings increase. Although elevator handling and storage facilities are relatively more efficient than on-farm facilities, farmers will continue to construct their own facilities if elevators do not provide equipment that can keep pace with harvesting equipment.

Not all regions in Ontario face the same shortage of facilities. For example, Eastern regions just entering grain corn production have a high proportion of field shelling and less developed marketing facilities. As corn output and farm size increase in these new production areas, the marketing system is expected to improve. Increased farm specialization will also help provide an incentive for improving the marketing system.

Perishability of field shelled corn increases the pressure on the marketing system. Combines, having a capacity of two to four times that of the corn picker, have shortened the harvesting season. In addition, combined corn having a moisture content of up to 30 percent must be conditioned within one or two days after harvesting. Thus, it is appropriate that both producers and marketing firms are considering the economics of performing the market functions of storing and conditioning the corn crop. The sooner the decision is made as to where these functions will be performed, the smaller will be the losses from forced decisions.

CANADA'S OILSEED SECTOR - AN OVERVIEW OF MARKETING AND TRADE

The outlook for Canadian oilseeds depends on several key issues including: technological development to improve the quality of oilseeds; the relative attractiveness and adaptability to producers in terms of prices, incomes, and stability; international demand; and national policies affecting the oilseed economy.

*O.A. Al-Zand**

INTRODUCTION

Oilseeds are important commodities in Canadian agriculture. Although oilseeds cultivation has a long history in Canada, the rapid rise in production, marketing and trade is a recent development. Until the early 1960's oilseeds acreage and production occupied a minor role in the Canadian agricultural economy.

The combined effect of expanding demand for vegetable oils and meals and the need to diversify Canadian agricultural enterprises stimulated larger production of these products. In 1972 the value of farm income from oilseeds was $239 million compared with $836 million for wheat and $219 million for barley.

Four types of oilseeds are produced and traded in Canada. These include soybeans, which are cultivated exclusively in a small area in South-Western Ontario, rapeseed, flaxseed, and to a lesser degree sunflowerseed, grown primarily in the prairie provinces[1]. These products contributed $239 million to gross farm income in 1972 in comparison with only $84 million in 1968 (Table 1).

TABLE 1. ESTIMATES OF FARM CASH RECEIPTS FROM OILSEEDS PRODUCED IN CANADA, CROP-YEARS, 1968-1972. (THOUSAND DOLLARS)

Crop	1968	1969	1970	1971	1972
Rapeseed	33,197	53,653	96,467	130,913	144,274
Soybeans	22,363	16,661	23,732	27,898	30,744
Flaxseed	26,593	56,792	59,427	56,938	53,687
Sunflowerseed[a]	1,517	2,040	3,321	10,144	10,200
All Oilseeds	83,670	129,146	182,947	225,893	238,905

[a]Derived on the basis of annual production valued at 6 cents per pound.

Source: *Coarse Grain Review,* Cat. No. 22-001, Statistics Canada.

In terms of production size, value added and market potential, rapeseed is emerging as a dominant crop in Canadian agriculture along with cereals. The con-

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[1]Small quantities of mustard seed with an average farm value of $7 million in the last four years (mostly of the yellow variety) are also grown in the prairie provinces. This crop, however, is not considered an important source of oil and meal. Almost all mustard seed produced in Canada is exported for use in manufactured mustard and other products.

tribution of rapeseed to farm income in 1972 was estimated at $144 million or about 60 percent of the total farm cash receipts from oilseed crops produced in Canada. Two-thirds of the rapeseed produced in Canada is usually exported while less than one-fifth is crushed domestically. In recent years, Canadian produced rapeseed oil supplied nearly one-third of the country's total edible vegetable oil products. Soybeans remain an important source of edible oil, but the crop's importance in this respect is diminishing as it is increasingly valued for its properties as a source of high quality protein meal in animal feeding and more recently in the food processing industries.

Canada is the world's largest producer and exporter of flaxseed and normally exports account for more than two-thirds of the yearly production. Flaxseed is primarily an industrial oil crop which also gives a high-protein meal by-product, largely used in livestock feeding.

The sunflowerseed acreage in Canada is concentrated in Manitoba. The crop is highly valued as a source of good quality oil in domestic and export markets. Specific varieties of sunflowerseed are used directly in confections and as bird and pet food, but their total acreage is small.

The overall objective of this paper is to examine the principal elements in the development of Canada's oilseed sector over the last decade. The following section reviews briefly the prices and pricing factors operating in the Canadian oilseeds market. The next section gives a detailed discussion of the status and growth of the production, markets and utilizations of individual oilseeds. The article concludes with a brief prospective of the anticipated international market forces affecting the future outlook for the oilseeds sector in Canada.

OILSEED PRICES

The viability of Canadian oilseed production and marketing as a vital agricultural sector is largely determined by the level of prices realized and costs incurred by the primary producers of the products involved over time. Prices of alternative crops, primarily wheat, represent the opportunity cost of oilseed production; fluctuations in returns to these crops have had a strong impact on oilseed production levels. All oilseeds grown in Canada have been self-sustaining in terms of achieving remunerable farm prices to farm producers without income subsidies or price support by government.[2]

[2] Oilseeds have been covered by the Agricultural Stabilization Act since 1958 but no payments have been made.

The price level of an individual oilseed is derived from the market value of the joint oil and meal products embodied in it. Since Canadian oilseeds have no direct use in human consumption or animal feeding before crushing, the first stage in the demand for these products is displayed in the demand for crushing. The demand for oilseeds by oilseed crushers is derived from the demand for oil, for edible and industrial uses, and for meal, for uses in animal feeding and for other purposes. Theoretically, the combined value of the oil-meal products of a given quantity of the raw oilseed minus the corresponding costs of processing each product can be interpreted as the value, or price indicator, of oilseed at the farm level.

The total value of the crushed oilseed is determined by the crushing yields of oil and meal and the corresponding market prices of these products. Except for soybeans which yield approximately 17 percent oil and 80 percent meal, the principal component in the value of Canadian produced oilseeds depends heavily on the value of their oil yields. The high oil content of rapeseed (40 percent), flaxseed (35 percent) and sunflowerseed (40 percent) has traditionally placed these seeds in the oil market rather than the animal feed market for the meal products derived from the crushing industry.[3] Rapeseed, sunflowerseed and soybean oils are primary inputs in margarine, shortening, salad and other edible oils, while linseed (flaxseed) oil is a base oil for various industrial products. In the case of soybeans, the overall value of meal derived from crushing one bushel of soybeans contributes about two-thirds of the value of the processed soybeans while the other one-third comes from the oil component. This relationship has been particularly apparent in recent years when the protein content and quality of soybeans have been increasingly valued in food processing and animal feed industries.

Recent price increases for rapeseed, flaxseed and sunflowerseed increasingly reflect the rising demand for high protein feed supplements embodied in the meal products of these seeds. The meal components of flaxseed (62 percent) and sunflowerseed (38 percent) are commercially acceptable protein concentrates in animal feeds. These meals have established market outlets in Canada and abroad. Rapeseed meal (60 percent of seed) has a growing usage in Canada and abroad as a feed supplement, particularly in cattle and swine feeding. Its overall feeding properties for livestock and poultry rations, and consequently its ultimate market value, are still under experimentation among livestock feeders and

[3] The crushing process produces some waste or by-products in addition to the oil and meal. In the case of sunflowerseed the oil component is appreciably more important than indicated by these percentages because the hulls are not used in the meal.

in feed processing industries. Rapeseed meal utilization, however, is expected to be drastically changed with the anticipated quality improvement of the product and the rising domestic and international demand for high protein feed supplements.

Since oilseeds produced in Canada are internationally traded commodities which compete with many other sources and types of oilseeds, their prices are subject to complex factors of supply and demand operating among major producing and consuming regions of the world. This contrasts to international wheat price formation where Canada is a major world supplier, exerting a substantial influence on the international prices under which wheat is traded. Canada tends to be more of a "price taker" for its oilseeds rather than an influential "price maker" as in the case of wheat.

Although farm prices of the various oilseeds are not entirely comparable, they do indicate the general level of oilseed values in comparison with other grains produced in the same areas. The price of soybeans has consistently maintained a sizable premium over the price of rapeseed, especially in recent years. Soybean prices show a definite upward trend with relative stability compared with other oilseeds. The maximum price premium for soybean over rapeseed in 1967-68 reached 76 cents per bushel.[4] Realized farm prices for flaxseed and sunflowerseed have shown a somewhat independent pattern in relation to soybean and rapeseed prices.

OILSEEDS AND MARKETS

Rapeseed

Rapeseed is the most extensively grown cash crop in Canada after cereals (wheat, barley, and oats). In the period 1971-73, more than 37 thousand farm units produced this crop on specialized grain or mixed grain farms in Western Canada[5]. Acreage planted in rapeseed reached a record level of 5.3 million acres in the 1971-72 crop year and a record production of 95 million bushels was harvested.

Rapeseed yields rose from an average of 15 bushels per acre during the early 1960's to about 17.5 bushels in the beginning of the 1970's. Production increase thus resulted from both yield and acreage expansions. During the period from 1962-64 to 1970-72, rapeseed production in Canada increased from an average of 71 to 83.6 million bushels.

The quality of the rapeseed produced has improved. Average oil content is at 40 percent compared with 35 percent in earlier years. This improvement has added greatly to the value of the crop as it is considered mainly as an oil crop rather than a joint oil-meal product as in the case of soybeans. More than 90 percent of rapeseed produced in Canada is of the new low erucic acid (LEAR) varieties. These yield an oil which is acceptable for edible purposes in domestic and foreign markets. The remaining high erucic acid rapeseed varieties are produced for their special oil content which has unique properties required for certain industrial purposes (e.g. particularly as a lubricant for fine instruments and tools).

Rapeseed meal is considered a by-product of the crushing industry. Its use is limited by the quality of its nutritional elements (mainly the glucosinolate component which has a negative side effect in animal feeding)[6]. The uncertainties regarding this quality factor have placed rapeseed meal in a less competitive position with other types of oilseed meals such as soybean and linseed oil meals which are widely used in the livestock and poultry feeding industries. This situation is rapidly changing with the increasing knowledge about rapeseed meal and the rising demand for new sources of high-protein feedstuffs, including rapeseed meal, to supplement the traditional sources of these products.

Rapeseed Market Outlets

During the period from 1962-64 to 1970-72, average yearly supplies (i.e. production and beginning stocks) of rapeseed increased from 8.4 to 90.9 million bushels (Table 2). Total supplies for the 1972-73 crop year were 100.4 million bushels. The four major outlets for rapeseed in any given year are: (1) export market; (2) domestic market; (3) other disappearance; and (4) ending commercial stocks.

Rapeseed is viewed chiefly as an export crop. In recent years more than 60 percent of rapeseed annual pro-

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[4] This premium has risen drastically during the 1972-73 crop year as a result of record high prices for soybeans and soybean meal, reflecting strong demand for high protein feed supplements accompanied with critical shortage in other meal supplies, namely fish meal from Peru.

[5] Based on reported *Canadian Wheat Board* delivery-permit book holders.

[6] The quality and utilization practices of rapeseed meal continue to yield positive results in animal and poultry feeding industries. For a useful guideline on the value and utilization limits of rapeseed meal in animal feeding see *Canadian Rapeseed Meal in Poultry and Animal Feeding,* Publication No. 16, Rapeseed Association of Canada, March 1972.

TABLE 2. RAPESEED AVERAGE SUPPLY AND DISPOSITION IN CANADA, CROP YEARS 1962-64 AND 1970-72 (THOUSAND BUSHELS)

Item	Quantity 1962-64	Quantity 1970-72	Percent Change
Supply			
Opening Stocks	1,330	7,331	451
Production	7,110	83,600	1,076
Total Supply	8,440	90,931	977
Disposition			
Exports	5,509	44,707	712
Crushing	1,595	10,313	547
Other Disappearance[a]	645	8,827	1,269
Ending Stocks	691	27,084	3,820
Total Disposition	8,440	90,931	977
Crushing	1,595	10,313	547
Oil Production (Thousand Pounds)	30,780	202,089	557
Oil-Meal Production (Thousand Pounds)	44,318	303,646	585

[a]Includes dockage, seeds fed on farms, waste and loss in handling.

Source: Coarse Grain Quarterly, Cat. No. 22-001; Oilseeds Review, Cat. No. 22-006, Statistics Canada.

duction has been exported. The size and growth of the export market for rapeseed is considered the principal driving force behind rapeseed production and marketing expansion which was experienced in the last ten years. Japan and the EEC are the two principal export market outlets, usually accounting for about 86 percent of total rapeseed exports. Japan, a steadily growing market for rapeseed, is absorbing more than 50 percent of that total. The EEC continues to be a vital market for Canadian rapeseed exports, but has shown considerable instability in volume taken over the last ten years.

Rapeseed exports to other countries in the mid 1960's became increasingly significant, reaching a record level of more than 8 million bushels in 1970-71. Major recipient countries in this group were mainly developing countries (e.g. India, Pakistan, Taiwan, Morocco, and Algeria) and certain Eastern European countries. Although the quantity of rapeseed crushed in Canada has been increasing at a steady rate, it has not increased as rapidly as rapeseed production. The result has been that the percentage of production crushed domestically decreased from 21 percent in the early 1960's to 12 percent in the early 1970's. Domestic crushing, however, has evolved as a stable and sustained outlet for rapeseed. As a result of this Canada has achieved an increasing degree of self-sufficiency in edible oil.

After the initial sale of rapeseed by farmers, the product is usually traded in domestic and export markets on a cleaned basis, i.e. has "graded levels" of dockage and/or foreign material. The dockage (or screenings) is the major item in the "other disappearance" category. Although not sold as a commercial product, it is used for feeding purposes. Other disappearance also includes rapeseed used for seeding. During the 1962-64 period other disappearance of rapeseed averaged about 9 percent of annual production. This proportion reached 11 percent during the 1970-72 period.

Yearly stock accumulations of rapeseed represent the residual crop left at the end of the crop year in both on and off-farm storage facilities. The level of ending stocks in any given year represents a prime indicator of the nature of balance between the supply of and demand for the product in that year. Much of the growth in rapeseed stocks accumulated in recent years results from increased levels of production and marketing of the commodity. Certain levels of reserve stocks, which might be termed "merchandizing stocks", are required to ensure a regular flow of the product over time, both within and between crop years. This level is estimated on the basis of the normal time lags required to bring the product from the primary producers to ultimate markets and the magnitude and variations of these requirements.[7]

Flaxseed

Over the last 15 years the flaxseed acreage planted in Canada has shown no significant trend. Yearly acreages exhibit a continuous fluctuation. Yields per acre planted in flaxseed, however, have increased from 7.6 bushels in the late 1950's to 13.4 bushels in the early 1970's. Consequently, in recent years a much smaller acreage has been required to produce a given quantity of the product in comparison to earlier years. This significant improvement in flaxseed yields has resulted in a notice-

[7]An optimum level of merchandizing stocks for rapeseed in Canada may vary over time. A "benchmark" estimate might be considered by the industry. An optimum level of merchandizing stocks for rapeseed, like any other crop, is largely dictated by the expected costs and benefits of the stocking operations. In the early stages of market development of a newly introduced crop, such as rapeseed, maintenance of a reasonable product flow in domestic and foreign markets is considered critical for the establishment and growth of these markets. Several factors must be considered in estimating an optimum level of merchandizing stocks. These include: (1) production seasonality and variations; (2) time lags required for the assembly, transportation and processing of the product; (3) capacity of and competition for the available marketing services including terminal facilities and shipping; and (4) anticipated contingency demand, particularly for exports.

able upward shift in total production of flaxseed, particularly in the most recent years.

In the period from 1962-64 to 1970-72, flaxseed production in Canada has increased by 53 percent from 19 to 29 million bushels. This increase was sufficient in placing Canada in the 1970's as the world's largest producers of flaxseed, surpassing both the U.S. and Argentina, the next two largest producers. Canadian share in the declining world's production has substantially increased from 14 percent in 1962-64 to 23 percent in 1970-72.[8]

Flaxseed Market Outlets

Linseed oil and linseed meal or cake are joint products of flaxseed after crushing. Traditionally, the demand for linseed oil, which amounts to 35 percent of the crushed seed, dictates the demand for flaxseed crushing. Linseed oil is essentially an industrial product and is used primarily as a base in the manufacture of paints, varnishes, linoleums, soap and numerous other specialty products. Linseed meal is a high protein and digestible animal feed which has long been in use. Its contribution is about 45 percent of the total value of the processed flaxseed, in comparison with only 32 percent in the case of rapeseed meal.

The export market is the principal outlet for Canadian produced flaxseed (Table 3). During the 1962-64 period, exports of flaxseed averaged 71 percent of the average production compared to 76 percent during 1970-72. Canadian flaxseed exports in the latter period were about 45 percent of the world's estimated total exports of 50 million bushels.[9] More than 90 percent of Canadian flaxseed exports are usually in the form of seeds. A small quantity of linseed oil and meal are customarily exported to the U.S. and the U.K. and more recently, substantial quantities of linseed meal were exported to the Netherlands. Since 1970-71, the EEC has more than doubled its imports of flaxseed from Canada in comparison with imports during the 1960's. Imports by the EEC reached a record level of 17 million bushels in 1971-72 or 66 percent of total Canadian flaxseed exports in that year. The importance of the U.K. market for flaxseed is diminishing and imports from Canada have declined from about 7 million bushels in 1958-59 to 1.6 million bushels in 1971-72. Japan has maintained its share in the total export market for flaxseed, taking an average quantity of about 4 million bushels or 20 percent of total exports. Exports to Eastern European countries remain negligible.

TABLE 3. FLAXSEED AVERAGE SUPPLY AND DISPOSITION IN CANADA, CROP YEARS 1962-64 AND 1970-72 (THOUSAND BUSHELS)

Item	Quantity 1962-64	Quantity 1970-72	Percent Change
Supply			
Opening Stocks	5,269	16,203	208
Production	19,162	29,323	53
Imports	24	—	—
Total Supply	24,455	45,526	86
Disposition			
Exports	13,516	22,192	64
Domestic Disappearance[a]	5,045	6,513	29
Ending Stocks	5,894	16,821	185
Total Disposition	24,455	45,526	86

[a]Includes industrial use for crushing, seed requirements, animal feed, waste, dockage and loss in handling.

Source: Coarse Grain Quarterly, Cat. No. 22-001, Oilseeds Review, Cat. No. 22-006, Statistics Canada.

Domestic disappearance of flaxseed, primarily for domestic crushing, increased by 29 percent in the period between 1962-64 to 1970-72. Domestic utilization of flaxseed, however, absorbed only 22 percent of production in the latter period. Since the increases in export and domestic marketing of flaxseed have not sufficiently coincided with supply availabilities in the early 1970's, a considerable enlargement occurred in the size of beginning and ending stocks of the product. Average ending stocks of flaxseed in the 1970-72 period, for example, were equal to three-fourths of average annual exports realized in that period, or 57 percent of average production. In 1972-73, production fell to 17.6 million bushels (4.8 million below 1971-72 production) with the result that stocks at the end of 1972-73 were only 7.8 million bushels.

Soybeans

Canada is an important producer, importer and exporter of soybeans and soybean products. The most striking development which occurred in the Canadian soybean industry in the last decade was the substantial increase in domestic soybean production from an average of 6.2 million bushels in 1962-64 to 11.5 million bushels in 1970-72 (Table 4). Consequently, Canada moved from 28 percent to 45 percent self-sufficiency in soybeans

[8]In the same period world production of flaxseed declined from 134 to 122 million bushels. George W. Kromer, *Structural Changes in the U.S. Flaxseed-Linseed Oil Industry,* Fats and Oils Situation, FAS - 264, U.S. Department of Agriculture, September 1972.

[9]*Foreign Agricultural Circular,* FFO 13-72, July 1972, Foreign Agricultural Service, U.S. Department of Agriculture, Page 5.

between the two periods. Domestic production of soybeans exceeded imports (by 2.8 million bushels) for the first time in the 1972-73 crop year. In recent years nearly all soybean supplies were crushed domestically; only a small amount was exported.

In addition to the oil produced from domestic and imported soybeans, total soybean oil supplies included 22 thousand tons of imported soybean oil per year during the 1970-72 period. During the same period, 33 thousand tons of soybean oil were exported. Average soybean meal net imports of about 110 thousand tons, however, were required to supplement domestic production of this product. Between the periods 1962-64 to 1970-72, Canada's soybean meal exports declined from 237 to 130 thousand tons while imports remained constant at 240 thousand tons. A sizable export market for soybean oil and meal existed for Canada in the U.K. The expansion of this trade was facilitated by the Commonwealth Preferential Tariff which resulted in a price advantage to exports of soybean products originating from Canada. Entry of the U.K. into the European Common Market at the beginning of 1972 resulted in a virtual elimination of the U.K. preferential tariffs and concessions allowed for Canadian soybean products exports.

TABLE 4. SOYBEANS AVERAGE SUPPLY AND DISPOSITION IN CANADA, CROP YEARS 1962-64 AND 1970-72 (THOUSAND BUSHELS)

Item	Quantity 1962-64	Quantity 1970-72	Percent Change
Supply			
Production	6,195	11,477	85
Imports	15,608	13,817	−11
Total Supply	21,803	25,294	16
Disposition			
Crushing	18,670	23,086	24
Exports	2,413	1,065	−56
Ending Stocks & Others[a]	720	1,143	
Total Disposition	21,803	25,294	16

[a]Represents the difference between total supply and domestic crushing plus exports.

Sources: *Coarse Grain Quarterly,* Cat. No. 22-001, Statistics Canada; *Oilseeds Review,* Cat. No. 22-006, Statistics Canada.

Besides active domestic soybean trading, Canada provides an important trade service to U.S. soybean exports. Canadian ports are heavily used for the transshipment of soybean exports from the U.S. to the world's markets. These shipments vary yearly; they reached a peak of 55 million bushels in 1969 and subsequently declined to 12 million bushels in 1972.[10]

Sunflowerseed

Sunflowerseed is known throughout the world as an important source of high quality oil. Its cultivation and marketing in Canada has a longer history than both rapeseed and soybeans. The relatively high values of both the oil and meal products of sunflowerseed indicate the potential of this crop for the Canadian oilseeds sector. Sunflowerseed oil prices, for example, maintain a high premium over soybean and rapeseed oil prices in European markets. In addition, sunflowerseed meal is considered a good source of feed, especially when supplemented with other high protein meals. In 1972, Canadian sunflowerseed acreage increased significantly to 239 thousand acres in comparison with only 71 thousand acres in 1970. The expansion resulted in more than tripling the production of sunflowerseed from 55.4 million pounds in 1970 to 169.1 million pounds in 1971. This new development marked a new shift in the production, marketing and trade in sunflowerseed in Canada (Table 5).

TABLE 5. SUNFLOWERSEEDS, AVERAGE SUPPLY AND DISPOSITION IN CANADA, CROP YEARS 1962-64 AND 1970-72 (MILLION POUNDS)

Item	Quantity 1962-64	Quantity 1970-72	Percent Change
Supply			
Production	29.4	131.5	347
Beginning Stocks	3.9	5.2	33
Total Supply	33.3	136.7	311
Disposition			
Crushing	13.6	57.4	322
Exports	13.5	50.4	273
Ending Stocks & Others[a]	6.2	28.9	366
Total Disposition	33.3	136.7	311

[a]Represents the difference between total supply and domestic crushing plus exports.

Source: *Coarse Grain Review (Quarterly),* Cat. No. 22-001; *Oilseeds Review,* Cat. No. 22-006, Statistics Canada.

In the period 1970-72, volumes of production, crushing and exports of sunflowerseed have increased by more than three-folds in comparison with the corresponding volumes in the 1962-64 period. The upward trend is continuing in 1973. For example, in the first nine

[10]*Soybean Digest, Blue Book,* The American Soybean Association.

months of calendar year 1973, sunflowerseed exports reached a record level of 68.1 million pounds (in comparison with calendar year exports of 53.4 and 25.4 million pounds in 1972 and 1971 respectively), at an estimated value of $6 million, or more than double the value of soybean exports, in the same period. In addition to the U.S., Germany and Netherlands, major new recipients of Canadian sunflowerseed exports have been added, including Italy, France and Japan. Domestic crushing of sunflowerseed is expanding at the same rate as production and is absorbing about half of production. This development reduced sunflowerseed oil imports into Canada from an average of 26 million pounds in 1966-67 to less than 3 million pounds in 1972-73.

FACTORS AFFECTING FUTURE OUTLOOK FOR OILSEEDS

The nature and direction of the growth and development of Canada's oilseed sector experienced over the last decade placed this country in a leading position among major world producers and traders of oilseeds. During this period world market prices realized for soybeans, rapeseed and flaxseed have been, and continue to be, profitable for Canadian producers of these products. The attractive level of prices accompanied by strong international market demand were considered the principal forces behind the growth of this sector.

With the rising level of world population and personal incomes, domestic and international demand for oilseeds and oilseed products is expected to continue expansion. International trade will play an increasingly vital role in transferring these products from surplus-producing countries to deficit countries. A major share of this world trade is expected to be maintained by the developed countries, particularly in the case of raw oilseeds and meals. The rise in consumption and utilization of total edible oils in these countries is gradually approaching the rate of population increase since the income effect is rapidly diminishing with per capita oil consumption reaching a saturation point.[11] On the other hand, many developing countries remain acute oil deficit areas in terms of both total requirements and the level of per capita oil intake considered adequate from the standpoint of nutritional needs. This situation entails a crucial shift in the distribution of oilseeds and their corresponding oil-meal products in accordance with relative weight of the corresponding demand for these products. Thus, it is expected that higher priority will be placed in developing countries on supplementing edible oil requirements for human consumption rather than obtaining oilcake or meal products. Oil meals have only a limited market in developing countries where intensive animal feeding industries are either lacking or are still at very early stages of development.

As a result of these evolving trends, exports, blend of oilseeds, oils and meals from Canada to the rest of the world will be greatly affected by:

(1) the potential size of total world's exports;

(2) the location and per unit cost of oilseed processing;

(3) the number and relative size of importing markets;

(4) the relative value of various oil and meal products in Canada and abroad; and

(5) the form and type of storage and transportation facilities required in trading in these products.

Domestic use of vegetable oil and meal in Canada is increasingly dependent on oilseeds produced and crushed domestically. This trend is expected to continue with rapeseed as a main source of edible oils for Canadian consumers. The type and degree of competition among domestically produced and imported oils (or oil extracted from imported oilseeds) will be governed by a number of economic, technical and trade factors. These factors can be classified into:

(1) price competition factors, i.e. price ratios between the various types of oils currently used in Canada; and

(2) non-price competition factors, including all forms of institutional constraints or accommodations and product differentiation practices among oils and oilseeds which might encourage the utilization of one type of oilseed or oil at the expense of others.

Since most vegetable oils consumed in Canada are close, but not perfect substitutes, non-price competition practices might emerge as the most effective competitive strategies in terms of maintaining and expanding product utilization in both traditional and new market outlets. These practices involve selective marketing activities designed to expand production and marketing of oilseeds and to maximize total revenue for the sector as a whole. Certain types of these activities will become

[11] Income elasticities of demand for food fats and oils as estimated by FAO are 0.14 and 0.13 for Western Europe and EEC respectively. *Agricultural Commodity Projections, 1970-1980,* Vol. 11, FAO, Committee on Commodity Problems, CCP 71/20, 1971, pp. 134-135.

increasingly vital for a sustained development of this sector. These include:

(1) product identification which emphasizes certain distinguishing features of the marketed product as an integral part of market development and promotional activities;

(2) trade accommodations, including maintenance of a reasonable degree of stability in the flow of supplies and prices, facilitating establishment of processing and storage in appropriate locations, providing intermediate or long-term contract selling and appropriate credit terms expected in export transactions; and

(3) industrial practices for influencing, or accommodating major developments and trends in the consumption of oilseed products in terms of quantity, quality and form of the products required by their ultimate users.

In summary, the outlook for Canadian oilseeds and products depends largely on the development of certain key issues affecting the production and marketing of these products in domestic and foreign markets. The most critical of these issues include: (1) technological development to improve the quality and acceptability of Canada's oilseeds; (2) the relative attractiveness and adaptability of oilseeds, particularly with respect to cereals, in Canadian agriculture, in terms of prices, incomes and stability which can be derived from oilseeds over time; (3) the extent and nature of growth in international demand for oilseeds and oilseed products; and (4) the direction and sensitivity of national policies affecting the operation and performance of the oilseed economy over time.

AN ECONOMIC ANALYSIS OF GRAIN-BEEF CATTLE FARMS IN THE LLOYDMINSTER BATTLEFORD AREA, SASKATCHEWAN, 1972

A 1972 survey of grain-cattle farms in Northwestern Saskatchewan shows that larger farms achieved higher net incomes, particularly when the livestock operation involved the production of finished beef.

However, in 1973, high grain prices along with unstable cattle markets, sparked a shift in emphasis to cash cropping.

*M.M. Sorboe**

INTRODUCTION

The Lloydminster-Battleford area of Saskatchewan is classified with the parkland mixed farming region where grain production, chiefly wheat, is the main cash crop and beef cattle production is the main livestock enterprise[1]. Beef cattle are produced largely in combination with cash grain crops including wheat, barley, oats, rapeseed and rye.

Not all of the land is suitable for grain production on many farms in the area. Patches of light mixed sandy soils subject to erosion, and shallow depressions too difficult to drain are often interspersed with arable grainland. Beef cattle enterprises can use these marginal lands to economic advantage.

Farmers in the study area sell most of their cattle by public auction at Lloydminster and Battleford. About 135,000 and 85,000 head of cattle were handled, respectively, by the Lloydminster and Battleford stockyards in 1972[2]. About 45 percent of the cattle were grain finished, 34 percent were calves and 9 percent were stocker and feeder heifers and steers. Cows and bulls accounted for the balance of 12 percent.

Local farm and corporate feedlot operators buy most of the feeder cattle passing through the yards, but patronage is drawn from an area within a radius of 150 miles. At least 75 percent of the feeder trade occurs in the fall and early winter months. Finished beef cattle from the area are traditionally shipped east to Winnipeg and to points in Ontario and Quebec.

PURPOSE OF STUDY

The general purpose of this study is to describe the farm organization, production practices, and financial status of grain-beef cattle farm operators in the designated area. Specifically, the data will be used:

1. to analyze the trends in the grain-beef cattle farm organization and practices in the parkland region;

2. to establish physical input-output coefficients for use in interdisciplinary research. These coefficients are used in evaluating research results at the farm level and to help formulate future recommendations; and

3. to determine the economic effects of adjustments

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*Mr. Sorboe is an economist in the Regina Regional Office of the Economics Branch, Agriculture Canada.

[1] Saskatchewan Soil Survey Report, Number 13, 1950.

[2] This information was obtained from the management of the local auction establishments.

TABLE 1. AVERAGE LAND USE ON GROUPS OF GRAIN-BEEF CATTLE FARMS, CENSUS DIVISION 17, SASKATCHEWAN, 1972

	Farm Groups				
	AC-AG	AC-HG	HC-AG	HC-HG	All Farms
Number of Farms	17	11	12	9	49
			—acres—		
Improved Land					
Wheat	90.3	161.8	135.4	314.3	158.5
Barley	59.0	233.1	70.5	202.7	127.4
Oats	20.3	52.8	39.2	74.1	42.1
Other Crop	40.5	167.3	38.3	124.5	83.8
Summerfallow and new Breaking	184.0	494.8	248.7	491.1	326.0
Grain Hay	55.9	56.5	78.3	104.1	70.4
Perennial Hay	41.7	78.0	62.1	69.5	60.0
Grain Pasture	4.8	2.7	12.5	—	5.3
Perennial Seeded Pasture	27.6	71.8	141.0	127.2	83.6
Total Improved Land	524.1	1318.8	826.0	1507.5	957.1
Owned Improved Land	470.8	909.9	813.5	1212.8	789.6
Rented Improved Land	53.3	408.9	12.5	294.7	167.5
Owned Grazing Land	274.2	274.4	522.8	388.9	356.2
Rented Grazing Land	55.0	134.2	92.5	211.2	110.6
Total Land Operated[a]	853.3	1727.4	1441.3	2107.6	1423.9

[a]Does not include community grazing lands. Grain enterprise acres include wheat, barley, oats, other crop, summerfallow and new breaking.

in the size of enterprises and changes in the beef production systems.

Method of Analysis

Forty-nine sample farm business records for the period November 1, 1971 to November 1, 1972 were classified into four groups based on the number of cows in the breeding herds and the number of acres in the grain enterprises. These groups were identified as containing farms with:

1. less than 58 cows and less than 804 grain acres (average cattle-average grain, AC-AG);

2. less than 58 cows and more than 804 grain acres (average cattle-high grain, AC-HG);

3. more than 58 cows and less than 804 grain acres (high cattle-average grain, HC-AG); and

4. more than 58 cows and more than 804 grain acres (high cattle-high grain, HC-HG)[3].

[3] Average cattle-average grain and the abbreviated terminology (AC-AG) infers that the number of breeding cows and grain acres approximates the averages for the area. Farms with less than 20 cows were not included in the sample. The sample farm averages of 58 cows and 804 grain acres were the criteria for farm grouping.

All physical assets were classified into three groups, namely: those used entirely in the cattle enterprise; those used entirely in the grain enterprise; and those used jointly in the cattle and grain enterprises.

Capital items (land, buildings, machinery and other inventories) were allocated to the cattle and grain enterprises according to their use. Receipts and expenses were credited the same way. Tractor overhead and operating costs were assigned to the cattle and grain enterprises by establishing acre-time ratios for all operations performed in the production, transportation and handling of forages and grain.

FARM PRACTICES

Land Use and Yields

The improved land area of the sample farms averaged 957 acres. About 43, 34 and 23 percent of this acreage was assigned, respectively, to threshed crops (cereal grains and rapeseed), summerfallow and forage crops (Table 1). About two-thirds of the threshed grain acreage was seeded summerfallow and one-third was seeded stubble land. Threshed acreages in order of importance were: wheat, barley, rapeseed, oats and rye.

TABLE 2. AVERAGE YIELD COMPARISON, 10-YEAR AVERAGE, 1972 CROP YEAR AVERAGE[a] AND AVERAGE YIELDS OF GRAIN-BEEF CATTLE FARMS, CENSUS DIVISION 17, SASKATCHEWAN, 1972

	Wheat			Barley			Oats		
	10-Year Average	1972 Average	Sample Average	10-Year Average	1972 Average	Sample Average	10-Year Average	1972 Average	Sample Average
AC-AG	24.3	21.4	21.3	36.6	38.2	34.0	47.8	44.6	44.7
AC-HG	23.6	20.8	21.3	35.9	38.1	38.1	46.3	42.8	43.2
HC-AG	24.5	22.1	21.7	38.0	39.5	39.3	48.2	45.8	52.1
HC-HG	24.5	21.9	24.0	37.6	38.8	39.9	47.8	47.1	58.8

[a]Source: Sixty-Seventh Annual Report of the Department of Agriculture of the Province of Saskatchewan.

High-grain groups (AC-HG and HC-HG) had 46.7 and 47.5 percent of their improved land in cash crops and less than 20 percent in forage production. Average-grain farms (AC-AG and HC-AG) had smaller proportions (40.1 and 34.3 percent) in cash grain but larger proportions of their improved land in forage crop production. Grain hay was produced on 7.3 percent of the improved land of all sample farms but varied from 10.7 percent for the AC-AG group to 4.3 percent for the AC-HG group.

Summer grazing was provided mainly by privately owned and leased land. All groups patronized community pastures, but the HC-HG farmers got more than 25 percent of their grazing from this source. Farmers inferred that future requirements of additional grazing would be met by more intensive reseeding, substitution of grainland for pasture and by the establishment of more community pastures.

Wheat yields per acre on sample farms in the study year were lower than the 10-year average, but compared favourably with the 1972 average yields of their respective municipalities. Barley yields exceeded the 10-year average, AC-AG group excepted, and oat yields on high-cattle groups were substantially higher than the 10-year and 1972 oat yields for their respective municipalities. High-cattle sample farm yields of all cereal grains exceeded those for average-cattle groups (Table 2).

Variations in grain yields between farms were large, partly because of differences in soil fertility, but also reflected differences in:

1. the proportions of summerfallow and stubble seeded acreages;

2. the rates of fertilizer application; and

3. the timeliness and incidence of rain.

Commercial fertilizer was applied on 85 percent of the sample farms. Sixty-nine percent of the total seeded acreage was fertilized at an average rate of 44 pounds an acre. With rare exception, 11-48-0 was used on summerfallow and 23-23-0 was applied on stubble seeded crops.

Average yields of 1.22 tons of grain hay and 0.98 tons of perennial hay were obtained per acre on sample farms. Eighty-five percent of the farmers produced grain forage to supplement perennial hay.

Breeding Herds and Calf Crops

Breeding herds in the study area in order of importance included Hereford, Shorthorn-Hereford mixed, Angus,

TABLE 3. SIZE OF BREEDING HERD AND NUMBER OF ANIMAL UNITS ON GROUPS OF GRAIN-BEEF CATTLE FARMS, CENSUS DIVISION 17, SASKATCHEWAN, 1972

	Farm Groups				
	AC-AG	AC-HG	HC-AG	HC-HG	All Farms
Number of Farms	17	11	12	9	49
Bred Cows and Heifers	36.5	40.5	80.3	86.3	57.3
	—average animal units per farm—				
Cows	32.9	39.5	69.5	83.6	52.7
Bulls[a]	2.0	2.3	6.1	3.3	3.3
Heifers	3.1	2.3	8.2	3.3	4.2
Steers	.2	1.3	.5	–	.5
Calves	5.6	9.3	18.1	18.5	11.9
Total Cattle	43.8	54.7	102.4	108.7	72.6
Horses	1.3	.9	2.6	3.3	1.9
Total Cattle Enterprise	45.1	55.6	105.0	112.0	74.5
Wine	1.4	7.3	.4	1.1	2.4
Poultry	.4	.2	.2	.5	.3
Total Grain Enterprise	1.8	7.5	.6	1.6	2.7

[a]Includes herd bulls and bulls produced for sale.

TABLE 4. AMOUNT AND KIND OF ROUGHAGE AND GRAIN USED ON GRAIN-BEEF CATTLE FARMS, CENSUS DIVISION 17, SASKATCHEWAN, 1972

Group	Number of Farms	Cattle Enterprise A.U.'s	Hay and Forage: Native Hay	Tame Hay	Grain Hay	Straw[a]	Grain
			—tons per animal unit—				
AC-AG	17	43.8	.24	.61	1.18	1.52	.41
AC-HG	11	54.7	.04	.73	1.13	1.15	.64
HC-AG	12	102.4	.25	1.55	.88	1.04	.48
HC-HG	9	108.7	.01	.48	1.21	1.17	.84
All Farms	49	72.6	.17	.92	1.08	1.19	.59

[a]It is estimated that one-half of this amount was used for cattle feed, the rest being used for bedding cattle and other livestock.

TABLE 5. SOURCE AND AMOUNT OF LABOR ON GRAIN-BEEF CATTLE FARMS, CENSUS DIVISION 17, SASKATCHEWAN, 1972

	Farm Groups: AC-AG	AC-HC	HC-AG	HC-HG	All Farms
Man Equivalent[a]	1.07	1.39	1.75	1.62	1.41
P.W.U.'s Per Farm[b]	296.6	596.3	492.6	759.6	496.9
P.W.U.'s Per M.E.[c]	277.0	430.4	281.6	468.6	352.8
	—average months per farm—				
Operator	10.4	11.1	11.4	11.5	11.0
Unpaid Family	1.8	2.8	6.4	5.6	3.8
Hired	.7	2.8	3.2	2.4	2.1
Total Labor	12.9	16.7	21.0	19.5	16.9

[a]A man-equivalent is 12 months of labor, equivalent to the work accomplished by an adult.

[b]Standard units as defined in Farm Management Data Manual, Alberta Department of Agriculture, page 828.

[c]Productive-work-units per man-equivalent is a measure of labor efficiency.

mixed crossbred, and Charolais. Breeding herds, including cows and bred heifers, averaged 57.3 head for all farms but ranged from 36.5 head for the AC-AG group to 86.3 head for the HC-HG group (Table 3).

The average weaned calf crop was 85 percent of all cows in the breeding herd, the same as the estimated net calf crop percentage for the population of the whole area.

Feeding Practices

Breeding herd feeding periods from mid-November until early May averaged 185 days. About 2.2 tons of hay and 700 pounds of oat and barley chop were fed per cow. High-grain groups fed more grain hay and less perennial hay per cow than did average-grain groups, but for all farms grain hay and perennial hay were used in equal amounts. About 0.6 ton of straw was also fed per cow (Table 4).

Feedlot finishing of calves began in the late fall with a 'warm-up' period of six to eight weeks when two to three pounds of oat and barley chop were gradually

TABLE 6. DISTRIBUTION OF LABOR, PRODUCTIVE-WORK-UNITS AND LABOR EFFICIENCY ON GRAIN-BEEF CATTLE FARMS, CENSUS DIVISION 17, SASKATCHEWAN, 1972

	Farm Groups: AC-AG		AC-HG		HC-AG		HC-HG	
	Cattle	Grain	Cattle	Grain	Cattle	Grain	Cattle	Grain
Labor Months	7.4	5.5	5.4	11.3	13.0	8.0	8.4	11.1
Man-Equivalents	0.62	0.45	0.45	0.94	1.09	0.66	0.70	0.92
Productive-Work-Units[a]	157	140	196	400	310	183	328	432
P.W.U.'s Per M.E.[b]	254	308	437	427	285	276	470	468

[a]Standard units as defined in Farm Management Data Manual, Alberta Department of Agriculture, page 828.

[b]Productive-work-units divided by man-equivalents of labor. This is a measure of labor efficiency.

TABLE 7. SUMMARY OF CATTLE ENTERPRISE INPUT-OUTPUT DATA ON GROUPS OF GRAIN-BEEF CATTLE FARMS, CENSUS DIVISION 17, SASKATCHEWAN, 1972

	Cattle Enterprise Groups			
	AC-AG	AC-HG	HC-AG	HC-HG
Number of Farms	17	11	12	9
Cattle Enterprise Animal Units per Farm	45.1	55.6	105.0	112.0
Improved Acres to Cattle Enterprise	130.0	209.0	293.9	300.8
Unimproved Acres to Cattle Enterprise	329.2	408.6	615.3	600.1
Cattle Enterprise Capital Investment	42,051	51,665	101,813	93,985
	—dollars per animal unit—			
Capital Investment:				
Land	300	242	270	230
Buildings	111	115	71	66
Machinery	117	153	169	156
Livestock and Supplies	404	420	460	388
Total Capital	932	930	970	840
Cattle Enterprise Income	131.71	151.58	145.40	151.30
Expenses:				
Land, Building and Fence Expense	13.26	15.05	9.38	9.63
Machinery Operating Costs	17.45	16.96	14.85	13.45
Custom Work	7.85	1.55	.99	1.86
Hired Labor	2.66	4.55	6.37	3.62
Value of Feed Grain and Purchased Forage	13.81	18.35	14.20	24.28
Crop Expenses	5.41	5.05	4.97	5.39
Livestock Expenses	5.43	4.71	4.66	5.39
Other Cash Expenses	5.12	2.88	3.05	2.46
Total Cash Expenses	70.99	69.10	58.47	66.08
Machinery Depreciation	15.37	18.02	19.90	16.11
Building Depreciation	6.25	5.45	3.95	3.87
Total Cattle Enterprise Expense	92.61	92.57	82.32	86.06
Family Farm Income	39.10	59.01	63.08	65.24
Less Value of Unpaid Labor	6.92	4.77	11.46	6.54
Operator and Capital Income	32.18	54.24	51.62	58.70
Less Interest (7%) on Investment	65.28	65.05	67.88	58.74
Operator's Labor Income	−33.10	−10.81	−16.26	− .04

increased to eight or ten pounds daily per head. Forage consumption decreased and in the latter half of the 180-day finishing period the feeders went on a full-feed ration of barley. Yearlings consumed 18 to 20 pounds of grain a day during the finishing stage. An equivalent of 45 bushels of barley were consumed per feeder over the entire finishing period.

Labor Supply, Use and Efficiency

The farm operators supplied 65 percent of the total labor requirement. Unpaid family members supplied 23 percent and hired help 12 percent. As farms grew the operator's time contribution declined relative to that of family members. HC-AG farms averaged the highest amount of unpaid labor (Table 5).

Fifty percent of the total labor on an average for all farms was used in the cattle enterprise. The share of labor by farm groups to the cattle enterprise was: AC-AG, 58 percent; AC-HG, 32 percent; HC-AG, 62 percent and, HC-HG, 43 percent (Table 6).

High-grain farmers were more efficient in labor use than average-grain farmers and this applied to either enterprise as was indicated by the number of productive-work-units accomplished per man-equivalent. The comparatively high labor efficiencies of the high-grain groups in the cattle enterprises were attributable to their intensive feedlot finishing operations, whereas, in the grain enterprises they were functionally related to size in terms of acres.

FINANCIAL ANALYSIS BY SIZE OF ENTERPRISE

The study indicated increasing net returns to size in the grain and cattle enterprises. Farms with large cattle numbers and grain acres had higher operator and capital incomes[4]. Grain production was the most profitable enterprise for all farm groups.

Beef Cattle Enterprise

Expansion in the cattle enterprises on average-grain farms (compare AC-AG with HC-AG, Table 7) brought higher net returns per cattle unit. The net income improvement reflected the increase in cattle enterprise income (due to greater emphasis on finish feeding) and economies in costs. The latter group had lower costs in all itemized cash expenses except hired labor and feed costs. The sum of custom work costs and machinery depreciation costs was lower on HC-AG farms. Building depreciation per cattle unit was substantially lower on the HC-AG farms than on the AC-AG farms.

On high-grain farms (compare AC-HG with HC-HG) the operator and capital incomes increase per animal unit resulted entirely from economies in costs. Cattle enterprise expansion effected large reductions in real estate expenses and machinery operating costs which more than offset higher feed grain and purchased forage costs. Other itemized cash expense differences between the two groups were marginal but both machinery and building depreciation per animal unit were lower on HC-HG farms compared with those for the AC-HG group.

Grain Enterprise

Cost economies which were relevant to grain production in the expansion of grain enterprises were attributed mainly to reductions in machinery expenses (compare AC-AG with AC-HG and HC-AG with HC-HG, Table 8). Machinery operating costs and depreciation substituted for hired custom work on AC-AG farms but the sum of the three machinery costs per acre was much lower on high-grain than on their average grain counterpart farms. 'Other cash expenses' and building depreciation per acre tended to decline with expansion in the grain enterprise.

[4] Net return and operator-capital income are synonymous terms defined as the residual return to the operator for his management, labor and capital investment inputs.

TABLE 8. SUMMARY OF GRAIN ENTERPRISE INPUT-OUTPUT DATA ON GROUPS OF GRAIN-BEEF CATTLE FARMS, CENSUS DIVISION 17, SASKATCHEWAN, 1972

	Grain Enterprise Groups			
	AC-AG	AC-HG	HC-AG	HC-HG
Number of Farms	17	11	12	9
Improved Acres to Grain Enterprise	394.1	1109.8	532.1	1206.7
Grain Enterprise Capital Investment	41,064	94,517	57,358	123,299
	—dollars per grain acre—			
Capital Investment:				
Land	74	50	67	64
Buildings	5	6	6	5
Machinery	25	28	35	33
Other	1	1	a	a
Total Capital	105	85	108	102
Grain Enterprise Income	24.57	23.98	21.96	28.02
Expenses:				
Land and Building Expense	3.27	2.78	1.32	1.72
Machinery Operating Costs	2.57	2.44	3.10	2.50
Custom Work	1.18	.16	.28	.11
Hired Labor	.32	.54	.75	.38
Value of Feed Grain Used	.37	.56	.12	.15
Crop Expenses	1.57	1.81	2.14	1.92
Livestock Expenses	.31	.14	.05	.02
Other Cash Expenses	.46	.32	.35	.30
Total Cash Expenses	10.05	8.75	8.11	7.10
Machinery Depreciation	3.45	3.57	4.47	3.60
Building Depreciation	.32	.30	.33	.29
Total Enterprise Expenses	13.82	12.62	12.91	10.99
Family Farm Income	10.75	11.36	9.05	17.03
Less Value of Unpaid Labor	.57	.51	1.39	.81
Operator and Capital Income	10.18	10.85	7.66	16.22
Less Interest (7%) on Capital	7.29	5.96	7.55	7.15
Operator's Labor Income	2.89	4.89	.11	9.07

[a]Less than $0.50.

Financial Analysis By Beef Production System

The beef production system - the production of feeder calves or finished yearlings - was a function of the size of the grain enterprises. Average grain farms tended to produce feeder calves and high-grain farms tended to produce finished yearlings. Finished beef cattle marketings by weight expressed as a proportion of the total weight of beef cattle sales were: AC-AG, 15 percent; AC-HG, 77 percent; HC-AG, 41 percent and, HC-HG, 66 percent. There also was a tendency of each operator to specialize either in feeder calves or finished cattle production.

Classification of the 49 farms on a basis of the beef production system derived the following groups:

1. Cow-calf operations (25 farms or 51 percent). Nearly all of the saleable calves were sold for feeder purposes shortly after weaning in the fall or early winter. No significant number of calves was purchased by this group;

2. Cow-calf-feedlot operations (18 farms or 37 percent). Nearly all of the saleable calves were grain fed over the winter and sold for slaughter in the spring or early summer. Five of these operators purchased substantial numbers of calves and yearling feeder stock ranging from 40 to 65 head for each of the five farms; and

3. Mixed cow-calf and feedlot operations (six farms - 12 percent). A substantial part of the calf crops were

sold in the fall. Late and lightweight calves were wintered or grain fed to finish and sold as yearlings the following spring or summer. This group purchased no feeder stock.

Cow-calf-feedlot operations were much larger in terms of cattle enterprise animal units and grain enterprise acres than cow-calf farms and had much more financial success. The net incomes per animal unit and grain acre for the feedlot farm group were larger because of higher gross incomes and economies in some relatively fixed costs (Table 9).

Cow-calf-feedlot operators in the cattle enterprises had lower real estate expenses, machinery operating costs, other cash expenses and building depreciation per animal unit than cow-calf operators. Highly variable costs such as the value of feed grain and livestock expenses per animal unit were higher, as expected, on feedlot enterprises but the addition to these costs was more than compensated for by the gross income increase per animal unit.

Cow-calf-feedlot operators in the grain enterprises had lower unit costs per acre than cow-calf farmers in all

TABLE 9. SUMMARY OF CATTLE AND GRAIN ENTERPRISE INPUT-OUTPUT DATA ON GROUPS OF GRAIN-BEEF CATTLE FARMS, CENSUS DIVISION 17, SASKATCHEWAN, 1972

	Cattle Enterprise		Grain Enterprise	
	Cow-Calf Feedlot Operations	Cow-Calf Operations	Cow-Calf Feedlot Operations	Cow-Calf Operations
Number of Farms	18	25	18	25
Number of Animal Units	84.5[a]	59.0[a]	2.7[b]	3.3[b]
Improved Acres	255.8	160.2	955.5	560.2
Unimproved Acres	391.0	439.8	–	–
	—dollars par A. U.—		—dollars per grain acre—	
Capital Investment:				
Land	265	250	57	64
Buildings	84	93	5	6
Machinery	151	136	30	29
Livestock and Supplies	424	390	1	1
Total Capital	924	869	93	100
Enterprise Income	169.73	124.03	26.72	23.12
Expenses:				
Land, Building and Fence Expense	9.94	13.10	1.92	2.56
Machinery Operating Costs	14.39	17.17	2.37	3.06
Custom Work	2.72	3.40	.31	.50
Hired Labor	4.53	3.80	.29	.61
Value of Feed Grain and Purchased Forage Used	24.04	12.10	.32	.42
Crop Expenses	5.31	5.30	2.09	1.72
Livestock Expenses	6.16	4.05	.10	.17
Other Cash Expenses	2.65	4.00	.29	.44
Total Cash Expenses	69.74	62.92	7.69	9.48
Machinery Depreciation	17.43	16.20	3.70	3.70
Building Depreciation	4.59	5.36	.28	.36
Total Enterprise Expenses	91.76	84.48	11.67	13.54
Family Farm Income	77.97	39.55	15.05	9.58
Less Value of Unpaid Labor	7.96	10.40	.89	.81
Operator and Capital Income	70.01	29.15	14.16	8.77
Less Interest (7%) on Investment	64.69	60.83	6.51	7.02
Operator's Labor Income	5.32	−31.68	7.65	1.75

[a]Beef cattle and saddle horses.

[b]Hogs and poultry.

itemized enterprise expenses except crop expenses and machinery depreciation. Higher crop expenses (seed, fertilizer and crop sprays) per grain acre for the feedlot group compared with the non-feedlot farms were more than compensated for by the difference in productivity.

Changes in Enterprise Costs and Returns

Farm input price changes in 1973 placed beef cattle production on grain-beef cattle farms in a less favourable position relative to cash grain than in 1972. The cost-price squeeze in the beef cattle industry in general, and in feedlot finishing in particular, has been further accentuated by more recent sharp upward movements in many of the major input factor costs, including feed grain and forage costs, crop expenses, livestock expenses and labor. The price of finished beef trended upward in the third quarter of 1973 but dropped suddenly in the fourth quarter after the end of the American price freeze. The resulting high level input cost and non-compensating product price situation in the beef cattle industry has shifted the competitive advantage dramatically in favour of the high priced cereal grain and oilseed crops.

Updated enterprise costs and returns for the 49 farms, shown in the accompanying tables, were calculated using the most recent price change information. It was assumed that the physical quantities of inputs and outputs remained constant at the 1972 level. Enterprise incomes were adjusted to reflect price increases for fall feeder calves, yearling slaughter cattle and cash grain. Itemized cash costs and non-cash expenses were adjusted to account for changes in input factor costs that occurred between the second quarters of 1972 and 1973[5].

Gross income per hundredweight in the beef cattle enterprise rose from $37.18 in 1972 to $45.73 in 1973 - an increase of 23 percent - and enterprise costs per hundredweight increased by 14 percent (Table 10). Operator and capital incomes of $12.84 in 1972 and $17.92 in 1973 per hundredweight of beef represent capital investment returns of only 5.5 percent and 7.25 percent, respectively, in those years.

More recent input-output price changes have caused a serious deterioration in the net returns for beef cattle and the prospect for obtaining a return on capital invested in the beef enterprise in 1974 appears very grim.

[5]Statistics Canada, Farm Input Price Indexes, Catalogue 62-004 quarterly, August 1973 and November 1973.

TABLE 10. CHANGES IN BEEF CATTLE ENTERPRISE COSTS AND RETURNS, 49 GRAIN-BEEF CATTLE FARMS, CENSUS DIVISION 17, SASKATCHEWAN

	1972[a]	1973[b]	Change
	—dollars per cwt.—		—percent—
Total Capital Investment	235.32	247.08	+ 5
Average Gross Income	37.18	45.73	+23
Land, Building and Fence Expense	2.87	3.07	+ 7
Machinery Operating Costs	3.93	4.17	+ 6
Custom Work	0.71	0.75	+ 5
Hired Labor	1.16	1.31	+13
Feed Grain and Purchased Forage	4.51	6.22	+38
Crop Expenses	1.33	1.61	+21
Livestock Expenses	1.29	1.56	+21
Other Cash Expenses	0.84	0.88	+ 5
Total Cash Expenses	16.64	19.57	+18
Depreciation (Machinery and Buildings)	5.70	5.98	+ 5
Value of Unpaid Labor	2.00	2.26	+13
Total Enterprise Costs	24.34	27.81	+14
Operator and Capital Income	12.84	17.92	+40

[a]Net beef cattle production for the period November 1971 to November 1972 was 29,060 pounds per farm (21,616 pounds net of feeder calf production and 7,444 pounds of gain from finish feeding).

[b]Capital investment and costs were updated by the use of Statistics Canada farm input price index changes from the second quarter of 1972 to the second quarter of 1973.

Phenomenal product price increases in the grain enterprise raised the gross returns per grain acre from $24.95 in 1972 to $56.36 in 1973, an increase of 126 percent. Enterprise costs rose modestly from $13.19 to $14.45 per acre. The per acre return to the operator for his labor and capital investment rose from $11.75 in 1972 to $41.91 in 1973, an increase of 257 percent (Table 11). Relatively stable grain prices, at or near current levels, accompanied by an estimated 30 to 35 percent increase in grain enterprise costs would still result in a projected operator and capital return of about $35.00 per grain acre in 1974.

CONCLUSIONS

Net returns on grain-beef cattle farms were subject to wide variations. Some factors affecting the level of net returns include the following:

1. The size or scale of enterprises. Large beef cattle and grain enterprises, singly or in combination, generated higher net incomes than small enterprises;

TABLE 11. CHANGES IN GRAIN ENTERPRISE COSTS AND RETURNS, 49 GRAIN-BEEF CATTLE FARMS, CENSUS DIVISION 17, SASKATCHEWAN

	1972	1973	Change
	–dollars per grain acre–		–percent–
Total Capital Investment	97.80	102.69	+ 5
Average Enterprise Income[a]	24.94	56.36	+126
Land and Building Expense	2.29	2.45	+ 7
Machinery Operating Costs	2.60	2.76	+ 6
Custom Work	0.35	0.37	+ 5
Hired Labor	0.49	0.55	+ 13
Feed Grain and Purchased Forage	0.32	0.44	+ 38
Crop Expenses	1.86	2.25	+ 21
Livestock Expenses	0.12	0.15	+ 21
Other Cash Expenses	0.35	0.37	+ 5
Total Cash Expenses	8.38	9.34	+ 12
Depreciation (Machinery and Buildings)	4.02	4.22	+ 5
Value of Unpaid Labor	0.79	0.89	+ 13
Total Enterprise Costs	13.19	14.45	+ 10
Operator and Capital Income	11.75	41.91	+257

[a]Farm value of grains in dollars per bushel for 1972 with 1973 values in brackets: wheat 2.00 (5.10); oats 0.78 (1.45); barley 0.95 (2.06); rye 1.15 (2.75); rapeseed 2.46 (5.57); flax 3.20 (9.52).

2. The beef production system. The degree of emphasis on cattle finishing was a function of the size of grain enterprises rather than the size of the breeding herds. Farms emphasizing finished cattle production had higher net returns per animal unit than farms emphasizing feeder cattle production;

3. The kind of cash crops produced and the yields obtained per acre; and

4. Management and functionally dependent factors such as the efficiency level of labor and capital resources, production decisions and cost controls.

Comparative group analysis indicated that the number of grain acres, the emphasis placed on cattle finishing and the yield of grain per acre were the factors accounting for most of the variation in the net incomes of the 49 sample farms. Superior management on high-grain farms was difficult to quantify but it was noticeably influential in achieving high levels of capital and labor efficiencies and economies in costs.

Expansion in the beef cattle enterprises resulted in decreasing costs per animal unit in real estate expenses, total machinery costs (the sum of machinery operating costs, hired custom work and machinery depreciation) and building depreciation. The cost economies more than offset higher unit feed costs resulting from cattle finishing.

Expansion in the grain enterprises resulted in decreasing costs per acre in machinery operating expenses, custom work, other cash expenses and building depreciation.

Based on the farm and enterprise group averages, several conclusions were drawn:

1. Cash grain cropping was more profitable than beef cattle production at the product price and factor cost levels in the study year.

2. Net incomes could be increased by shifting the grain hay and pasture land to cash grain production. The cash grain production capability of the land as shown by grain hay yields of one ton or more per acre and farmer valuations of grain hay and forage lands at about 90 percent of the value of cash grain producing lands indicated a cash grain productive capability of about $24.00 and $21.00 gross income per acre, respectively, for cow-calf feedlot and cow-calf farms in the study year. Cost analysis showed that the average costs per grain acre decreased with expansion in the grain enterprises. Consequently, net incomes could be expected to improve by replacing grain forage acres with cash grain and disposing of part of the cow herd.

3. It was more profitable in the year of study, for cow-calf feedlot operators to finish calves over the winter months than to sell them as calves in the fall. The farm value of feed barley at 68 cents a bushel in the fourth quarter of 1971 was low relative to the slaughter cattle price of about $34.00 per hundredweight in the spring of 1972[6]. There was little, if any, opportunity cost advantage attached to the use of buildings and labor during the winter in the feedlot finishing phase of the operation because economically profitable alternative uses for these resources were practically non-existent.

Financial success in feedlot finishing, however, requires a high degree of management expertise. It was observed that in the farm group comparisons, cow-calf feedlot operators were more efficient in capital and labor use and their costs per hundredweight of beef produced were lower than for cow-calf operators. However, the

[6]M.M. Sorboe, Farm Feedlot Costs and Returns, Canadian Farm Economics, Volume 8, Number 3, June 1973.

coefficient of variation in costs was higher on cow-calf feedlot farms. Apparently, costs and returns in feedlot finishing varied widely among individual farms because of the differences in the operators' management skills.

4. Recent unprecedented increases in the price levels of cereal grains and oilseeds, relative to beef cattle prices, have shifted the competitive advantage in the direction of cash grain production. Feedlot finishing in particular, is unprofitable because of high feed grain prices and sharp increases in other factor input costs. Cow-calf enterprises are not yielding a satisfactory return to fixed factors.

5. As a result, the beef cattle production system may undergo changes, trending from cow-calf to cow-yearling feeder production in order to maximize gains from grass. Leaner beef from short-fed, semi-finished cattle will likely displace some of the highly finished beef traditionally produced. The degree of change will depend largely on the future feed grain and finished cattle price relationship.

The temptation to convert tame hay and tame pasture land to cash grain production in order to reap the benefits of currently high potential incomes should be analyzed carefully because of possible future price changes. Short run economic gains may be more than offset by long run economic losses if shifts from cattle to grain are carried to the extreme.

Short run gradual adjustments can be made by many grain-beef cattle operators to minimize the contraction of the beef cattle herd. For example, reseeding of perennial pasture lands with grass varieties which provide early spring pasture and extended fall grazing can shorten the winter feeding period and thereby reduce winter forage requirements. Measures could be taken to increase the productivity of perennial and native haylands.

The study indicated that many farmers tend to overfeed their cows and replacement heifers during the winter. Experimental research with different levels of feed intake suggests that breeding animals suffer no ill effects from a ration that causes some weight loss over the winter[7]. In fact, there is some evidence that well managed feed rationing in the winter followed by full feeding after calving has a stimulatory effect on conception.

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[7] J.D. Milligan, Feeding for Conception, Fifteenth Annual Stockman's Day Report, June 4, 1970, Department of Animal Science, University of Saskatchewan, Saskatoon, page 40.

ANALYSIS OF MACHINERY INVESTMENT AND FINANCING USING CAPITAL BUDGETING

At high discount and tax rates, credit financing and financial leases may provide a lower cost method of financing investment in a combine. Capital budgeting methods are used to analyze several methods of financing the investment.

Robert L. Batterham *

INTRODUCTION

This paper has two objectives. The first is to outline an economic model[1] that might be used by extension workers and others to assist a farmer who wishes to invest in farm machinery. This management problem has received little attention in Canada, and is barely mentioned in the Report of the Royal Commission on Farm Machinery.

Examination of the farm machinery investment problem provides an opportunity to demonstrate the use of capital budgeting procedures for the analysis of investment proposals. The use of capital budgeting in the evaluation of investment alternatives is well documented in economic literature[2] and has been used for research purposes, but apparently, extension workers have made only restricted use of these techniques in helping to solve investment problems.

The second, and more important objective of the paper is to extend the model so that consideration of the best method of financing the investment can be included in the analysis.

In the first section of the paper, cost curve analysis, the most frequently used economic model for the selection of farm machinery, is examined and rejected. An investment model is then proposed, using capital budgeting as a method of analysis. A simple example comparing alternative investments is then given. The example is designed to illustrate contradictions in the results between the cost curve and capital budgeting approach.

Simple extensions are then made to the investment model so that alternative financial methods can be analyzed. Finally, several financial alternatives for investment in a combine are analyzed.

INVESTMENT IN FARM MACHINES

Investment decisions are among the most critical of management decisions that farmers have to make. Their importance emanates from a number of factors. Typically, they involve the expenditure of large sums of

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[1] It is not suggested that economic factors alone are relevant when a farmer is contemplating an investment in farm machinery. Engineering and agronomic factors are also important (see Batterham, Brown and Van Die (6)), as are intangibles, such as personal preference. However, an economic evaluation can assist in apportioning opportunity costs to some of the non-economic factors.

[2] See, for example, Van Horne (16), the list of references at the end of Chapter 3; or Bierman and Smidt (7) the Bibliography.

money; it may be both difficult and costly to change a decision once taken; some farmers make such decisions infrequently and thus experience is only gained in the long-term; the results of investment decisions are usually realized over a relatively long period of time, therefore, the time preference decision makers have for income (or consumption) must be considered; and the element of uncertainty concerning return on investment is enhanced.

It is unusual for an investment to be exclusively associated with a single farm machine and instead, it often forms an integral part of a wider investment in a farm machinery system. The apparent inter-relationships suggest a complex situation calling for detailed analysis of the total farm investment decision. An analyst, with call on computing facilities, would therefore be an essential tool for farmers considering an investment decision. The analyst could use an appropriate model to specify several investment and financing alternatives for a farm machine or farm machine system, in terms of the decision makers' objectives and also perhaps in terms of opportunity costs.

The Cost-Curve Approach to Selecting Farm Machinery

Classical economic theory indicates that short-run average total cost curves can be constructed, for a given plant size, by varying the amount of product processed by the plant (Figure 1). A production function and a series of price ratios can be subsumed within the construction of the cost curve[3] and a series of short-run cost curves can be constructed and joined by the "envelope" or long-run average cost curve. The optimum plant size is then determined by minimizing long-run average costs (Figure 2).

Cost-curve analysis has been widely used to determine the optimum size of farm machinery inputs. An analogy can be drawn between a farm machine (or system of farm machines) and a plant processing a product. In this case the product is the crop operation performed by the machine. The objective of the machine selection operation is to minimize the long-run average total costs, subject to the constraint that the machine be potentially capable of performing the desired crop operation.

Many studies have been carried out to determine the costs of owning and operating farm machinery. These studies generally use either the statistical (cross section or survey) approach, or the budget (synthetic or engineering) approach, or a combination of each[4]. Ownership or fixed costs typically include such items as depreciation and interest. Operating or variable costs include fuel, lubrication, repair, maintenance and labor costs. A cost covering "untimely" crop operations may also be included in this category. This item can be defined as a crop operation performed outside the optimum time period in which maximum potential yield would be achieved. The duration of the optimum time period for a crop operation will vary with the crop variety, with past, present and future weather conditions, and with the particular crop operation being performed. The reduction in yield caused by an untimely operation can be considered as a cost, which will vary for different machines having differing work capacities[5].

Partial budgeting[6] has often been used as a method to determine which machine a farmer should purchase. The methodology is derived from that of the cost-curve approach.

In the evaluation of any investment, cost-curve analysis can be criticized because it ignores the influence of time. More specifically, in the selection of farm machinery, the analysis indicates an "optimum plant size", but it does not show the farmer how to move from his current to an optimum plant size along a "growth path". Of major importance, the timing of cash flows from an investment is ignored. Thus, no account is taken of the decision maker's time preference for income. However, much of the data collected in cost-curve studies can be adapted for use in investment models for farm machinery where time is explicitly considered.

The Investment Theory Approach to the Selection of Farm Machinery

Several methods of analyzing an investment, given the cash flows generated by that investment, are available which use various investment criteria. Non-discounted cash flow methods such as the average rate of return and payback period are generally rejected because they do not adequately consider time in the investment

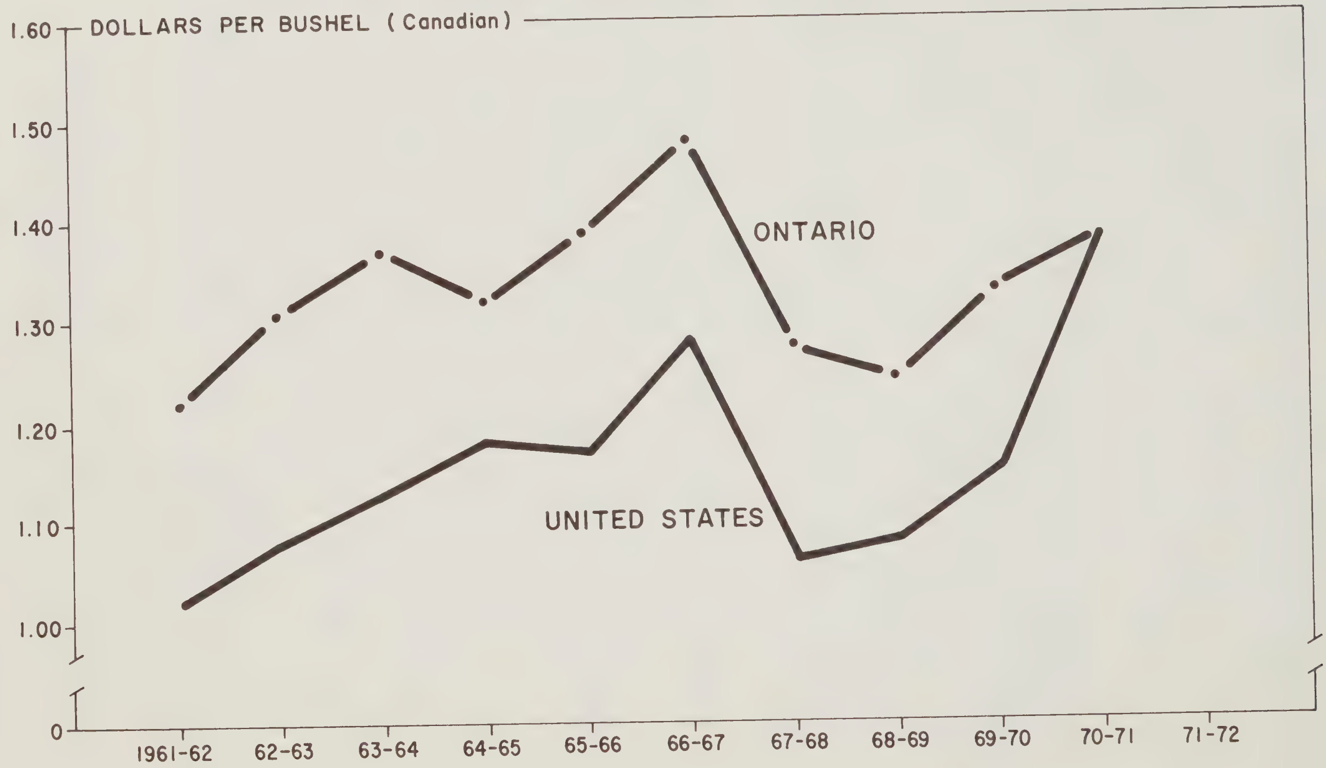
[3] Watson D.S. "Price Theory and Its Uses", pp. 189-198.

[4] Dillon (9) and Johnson (13) provide examples of the use of the statistical approach, while Heady and Krenz (10) and Ihnen and Heady (12) have used the budget approach.

[5] For more details of research into the cost of untimely crop operations, see Batterham, Brown and Van Die (6).

[6] In terms of production economics, the partial budget represents a process ray to a given production function.

CORN; AVERAGE SEASON PRICE RECEIVED BY PRODUCERS IN ONTARIO AND THE UNITED STATES, 1961-62 TO 1971-72



Source: Supplement for 1971 to feed Statistics ERS, USDA Washington, D.C. Agricultural Statistics for Ontario, Ministry of Agriculture and Food, Toronto, Ontario.

Figure 1

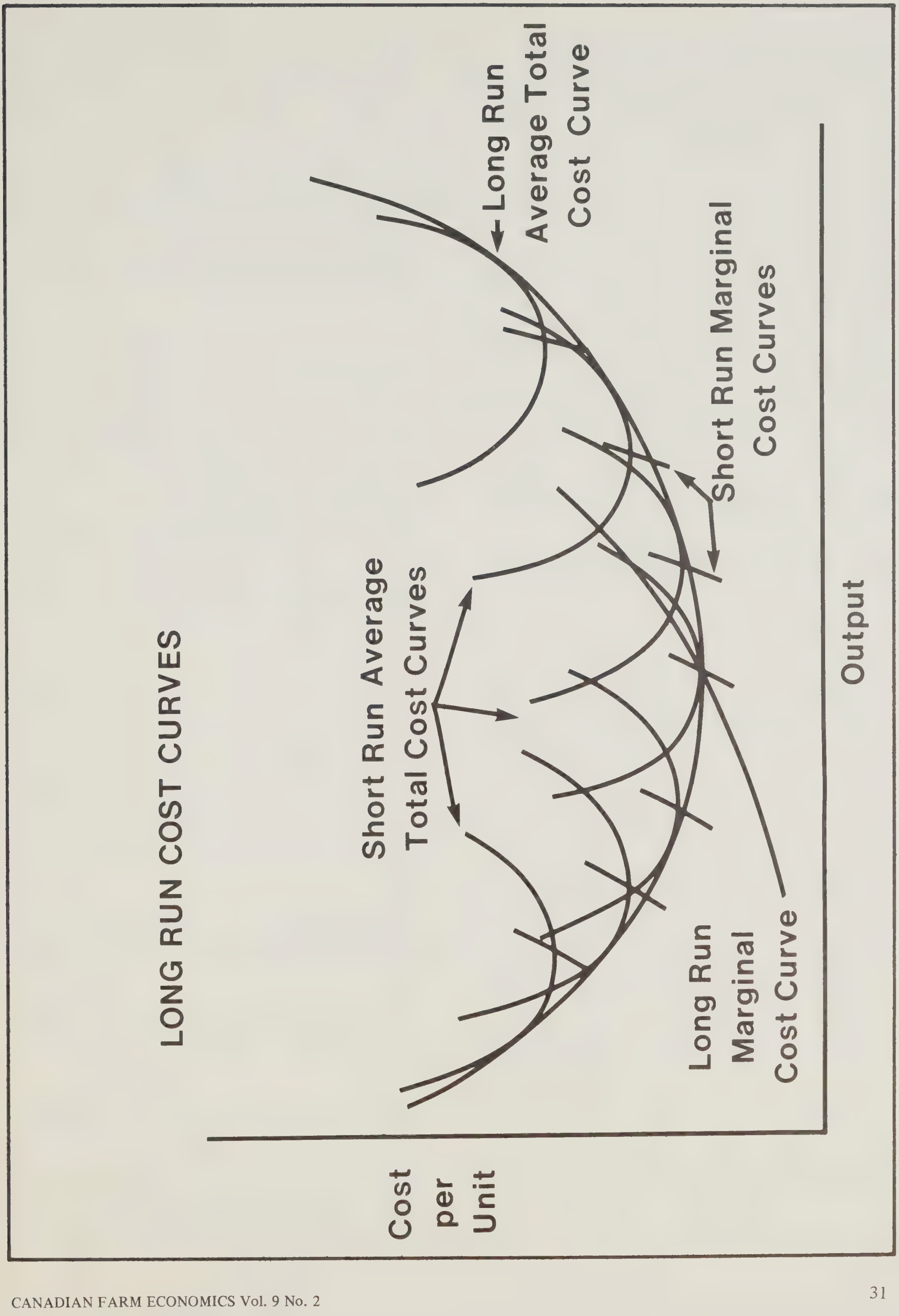

LONG RUN COST CURVES
Cost per Unit
Output
Long Run Average Total Cost Curve
Short Run Marginal Cost Curves
Short Run Average Total Cost Curves
Long Run Marginal Cost Curve

Figure 2

decision[7]. Similarly, the benefit/cost ratio has also been rejected because it does not consider the magnitude of capital required for an investment. Two discounted cash flow criteria remain for consideration - the net present value and the internal rate of return.

The internal rate of return is defined as that rate of discount that equates discounted revenues of an investment to discounted costs. The investment is considered to be profitable if the market rate of interest is less than the internal rate of return. The major practical problem in using this investment criterion is that it is difficult to calculate, and under some conditions will not give unique results[8]. A major theoretical anomaly concerning the internal rate of return is that funds generated by an investment must be immediately re-invested at the same rate of return for the criterion to yield a valid answer. This is rarely possible in practice.

The capital budgeting technique is based on a theory of investment developed by Hirshleifer, who assumed that the objective of the decision maker is to maximize the utility of a stream of consumption over time. To achieve this objective, the decision maker should maximize the net present value of the investment opportunities open to him[9].

The determination of cash flows over time is the most difficult step in any investment analysis and several components of the cash flows generated by machinery investment deserve special consideration. Specifically, capital cost (i.e. the outlays made in acquiring the machine) and operating costs (i.e. the costs of using the machine) are distinguished. The treatment of the former in investment analysis is quite distinct from that in cost-curve analysis.

In capital budgeting analysis, depreciation is calculated in a direct manner. Necessary information requirements include the initial cost of the machine, its useful economic life, and the salvage value (if any) at the end of that life. An annual (or accounting) depreciation charge is calculated as a step in the further calculation of the tax deduction associated with the "capital cost allowance" (i.e. depreciation) on a farm machine. This tax deduction reduces a farmer's taxation obligations. Thus, while annual depreciation charges do not enter the cash flows for investment analysis directly, their indirect effect via tax savings may be very significant.

The treatment of interest in investment analysis poses a further problem. Interest on borrowed capital is included in the analysis while interest on equity capital is excluded. This is particularly important in analyses of alternative methods of financing an investment.

The costs of operating a machine are relatively easy to include in cash flows. They are treated as a cash flow in the time period in which they occur.

The discount rate is the only additional information required to calculate the net present value of the machinery investment and it should reflect the rate of time preference that the farmer holds for present versus future consumption. This figure is usually approximated by the "market rate of interest" for borrowing the funds that might be used to finance the investment, as a proxy for the opportunity cost of capital[10].

The net present value of an investment is thus relatively simple to calculate using capital budgeting techniques and given the relevant cash flows and discount rate. More importantly, the use of capital budgeting explicitly includes consideration of the decision maker's preference for consumption over time.

A salient feature of the investment theory approach to the selection of a single farm machine is that it can be extended in two ways. Risks associated with the costs and returns from an investment can be analyzed within a present value variation of a "portfolio selection" model[11]. Also, a farm machine system can be selected using capital budgeting within the framework of a linear programming model. (Risk could be included in the selection problem using quadratic instead of linear programming)[12].

EVALUATION OF AN INVESTMENT IN A FARM MACHINE USING THE CAPITAL BUDGETING TECHNIQUE -

To illustrate the mechanics of the investment theory approach, using capital budgeting techniques applied to

[7]Van Horne, J.C., "Financial Management and Policy", pp. 51-53.

[8]This problem can occur when costs and returns from an investment fluctuate widely through time. This may occur with an investment in farm machinery.

[9]Hirshleifer (11) has demonstrated this using a two-period model of income and consumption opportunities.

[10]It is important not to confuse the discount and interest rates, however, when financing alternatives are analyzed. (See Section 4).

[11]The portfolio selection problem has been definitively stated and analyzed by Markowitz (14).

[12]These extensions of the investment analysis are discussed in detail in Batterham (4). They are also specifically applied to the farm machinery system investment problem in an unpublished paper (1).

farm machinery selection, the purchase of a combine is compared with custom hiring. The figures used are hypothetical and no empirical significance should be attached to the results.

It is assumed that the services provided by the custom operator would be identical to those provided by the farmer with his own machine. In particular, this infers that the custom operator would be available whenever required[13], and therefore, the returns from each of the alternatives would be identical. Thus, it is only necessary to consider costs, and the stated objective is to minimize discounted costs.

It is further assumed that 300 acres will be harvested each year, and plans for a 10-year period (the "planning horizon") are underway.

Purchase of a Combine

The combine (70 hp. with a two-row corn head) is assumed to cost $12,000 cash (with a list price of $14,000), and will be sold in 10 years for $1,000. The operating costs are shown in Table 1.

TABLE 1. OPERATING COSTS OF THE COMBINE

	Cost per Acre
Fuel and lubrication	$ .65
Labor	1.67
Repairs	1.20
	$3.52

It is assumed that labor is hired such that the custom hiring and purchased machine are equivalent in terms of labor requirements. If the farmer did not wish to hire labor, the opportunity cost of his labor should be used in the calculations. However, this would not be tax deductable, and would change the taxation implications of the example.

A tax credit can be claimed on operating costs. For the combine harvesting 300 acres per year, operating costs will be $1,056, and if the farmer is in a 25 percent tax bracket, a tax credit of $264 can be claimed[14].

A tax credit can also be claimed on the capital cost allowance for a farm machine. Under Part II of the Canadian Income Tax Regulations[15], farm machines are grouped into classes and the maximum capital cost allowance is calculated as a given percentage of the depreciated value of all equipment in a given class. It is not necessary to claim the maximum capital cost allowance in any one year. If income varies widely from year to year, it may pay to claim the maximum capital cost allowance in high income years, and less than the maximum allowance in low income years. In the present example, it is assumed, for simplicity, that the combine is the only machine in the class (class 10), and that the maximum capital cost allowance is claimed annually. (N.B. the allowance in this example is calculated solely to determine the tax credit). Annual cash flows can then be calculated (Table 3).

TABLE 2. CALCULATION OF TAX CREDIT ON CAPITAL COST ALLOWANCE ON $12,000 COMBINE WITH 25 PERCENT TAX RATE

Year	Capital Cost Allowance Claimed[a]	Tax Credit on Capital Cost Allowance
1	3600.00	900.00
2	2520.00	630.00
3	1764.00	441.00
4	1234.00	308.70
5	864.36	216.09
6	605.05	151.26
7	423.53	105.88
8	296.47	74.11
9	207.53	51.88
10	145.27	36.31

[a]The capital cost allowances are calculated using the diminishing balance method with 30 percent of the previous years' undepreciated cost being allowed.

TABLE 3. CALCULATION OF NET CASH FLOWS FOR COMBINE INVESTMENT

Year	Operating Cost	Total Tax Credits[a]	Net Cash Flow
1	-1056	1164	108
2	-1056	894	-162
3	-1056	705	-351
4	-1056	572	-484
5	-1056	480	-576
6	-1056	415	-641
7	-1056	369	-687
8	-1056	338	-718
9	-1056	316	-740
10	-1056	135[b]	79[c]

[a]Tax credits from operating cost and cost allowance are summed.

[b]In Year 10, the undepreciated value of the combine would be $339.00. If the combine were sold for $1000.00, income in Year 10 would be increased by $661.00. Taxes would, therefore, be increased by $165.25. Without this increase in taxes, the tax credit would have been $300.00.

[c]The salvage value of $1000 has been added to the operating cost and tax credit.

[13]If the custom operator was not available at the time desired, a charge for crop losses due to the untimely harvest could be included in the custom hiring cost.

[14]This method of calculating the tax credit is accurate as long as the total tax credits do not reduce taxable income sufficiently to place the farmer in a lower tax bracket.

[15]See Commercial Clearing House (8), for details of the Tax Regulations.

The initial investment cash flow is not discounted, but is multiplied by a present value factor of 1.0. Cash flows in other years are multiplied by their respective present value factors to given discounted cash flows. These are then summed to give the net present value of the investment.

TABLE 4. PRESENT VALUE CALCULATION FOR THE COMBINE INVESTMENT

Year	Cash Flow	Present Value Factor	Discounted Cash Flow
	The initial investment is		-12000
1	108	0.9091	98
2	-162	0.8264	-133
3	-351	0.7513	-263
4	-484	0.6830	-330
5	-576	0.6209	-357
6	-641	0.5645	-361
7	-687	0.5132	-352
8	-718	0.4665	-334
9	-740	0.4241	-313
10	79	0.3855	30
	The net present value of the proposed investment is		-14320

[a]The Present Value Factors are based on a discount rate of 10 percent. This rate was chosen arbitrarily for illustrative purposes.

Hiring the Custom Combine

The hiring of a custom operator can also be considered as an investment, with the investment being in purchasing "harvesting services" annually. Assume that the custom operation costs $10.00 per acre, which includes the combine and operator. The $10.00 per acre (total $3,000 for 300 acres) is an operating expense and is thus eligible for a tax credit claim. The tax credit is $750, giving a net cash flow each year of $-2,250. The net present value for "investment" in the custom combine is calculated in Table 5.

Comparison of the Purchase and Hire Alternatives

The net present value of purchasing the combine is $-14,320 and the corresponding net present value of hiring is $-13,825. This indicates that hiring is preferable to purchasing by a value of $495, when the discount rate is 10 percent[16]. This could be interpreted as indicating that if the farmer paid a retainer of $495 to guarantee that the custom combine would be available to him, he would be equally well-off hiring or purchasing.

TABLE 5. PRESENT VALUE CALCULATION FOR THE CUSTOM COMBINE

Year	Cash Flow	Present Value Factor	Discounted Cash Flow
1	-2250	0.9091	-2045
2	-2250	0.8264	-1859
3	-2250	0.7513	-1690
4	-2250	0.6830	-1536
5	-2250	0.6209	-1397
6	-2250	0.5645	-1270
7	-2250	0.5132	-1154
8	-2250	0.4665	-1049
9	-2250	0.4241	- 954
10	-2250	0.3855	- 867
	The net present value of the proposed investment is		-13825[a]

[a]This calculation can be made very simply using tables for the Present Value of an Annuity (see Batterham (3)).

This analysis has not included the costs associated with untimely field operations. These would have to be considered if machines of unequal real capacity were compared. The absolute profitability of the purchasing and hiring alternatives have not been indicated as returns have not been considered, since in this case they should be the same for each alternative.

Partial Budgeting Approach to the Investment Decision

It is pertinent to observe that cost-curve analysis, using partial budgeting procedures, would have reversed the investment decision and indicated purchasing rather than hiring as the more desirable alternative (Table 6).

The offering solutions generated by the two analyses result from the treatment of the timing of the cash flows. When the timing is taken into account, the large outlay required for purchasing the combine reduces its desirability. This immediately raises the question of the effect of credit financing on such purchases.

ANALYSIS OF THE FINANCING OF AN INVESTMENT IN FARM MACHINERY

Investment theory, and specifically the capital budgeting technique, can be applied to analyze various methods of financing an investment[17]. The analysis can be subdivided into a series of steps.

[16]At a discount rate of about 9 percent, the two alternatives break even. At lower discount rates, purchasing the combine is preferable.

[17]This is discussed in detail in Batterham and Blonde (5).

TABLE 6. PARTIAL BUDGETING COMPARISON OF PURCHASE AND HIRING OF COMBINE (COSTS PER YEAR)

Purchase

Fixed Costs

Interest = Average Investment x Interest Rate

$$= \frac{12000 + 1000}{2} = .10 \qquad = \$650.00$$

$$\text{Depreciation} = \frac{\text{Initial Cost} - \text{Salvage Value}}{\text{Length of Life}}$$

$$= \frac{12000 - 1000}{10} \qquad = 1100.00$$

$$\text{Tax Credit on Capital Cost Allowance} = \frac{\text{Total tax credit for capital cost allowance}}{\text{Length of life}}$$

$$= \frac{3847}{10} \qquad = -385.00$$

Operating Costs

Operating cost	= 1056.00
Tax Credit on operating cost	= −264.00
Total Cost per Year	$ 2157.00
Average Total Cost per Acre	$ 7.19

Hiring

Cost per acre	10.00
Tax credit	−2.50
Average Total Cost per Acre	$ 7.50

The various sources of credit available to finance the purchase of farm machinery should first be investigated. Some of the more frequently used sources of credit, in approximate order of increasing interest rates are: Farm Improvement Loans; Demand Notes; Personal Loans (the latter three available from the Chartered Banks); loans from the credit subsidiaries of machinery manufactures; and loans from finance companies. The cheaper the source of credit the farmer can use, the better.

Calculate the principal and interest repayments associated with the loan. The frequency of repayment (monthly, quarterly, annually, etc.) can be arranged to suit the farmer's convenience. The size of each repayment can be calculated using amortization tables. Tax credits may be taken on the interest payments and these should be included in the net cash flows. Operating costs can be ignored if only a single machine is examined.

Finally, discount the net cash flows, and sum them to give the net present value of financing alternatives. The net present value of any alternative can be compared simply with cash purchases.

Illustration of the Analysis of Financing Alternatives

The financing alternatives considered are based on survey data collected by Batterham and Blonde. In addition to cash purchase (which was analyzed in an earlier section and which forms the standard for comparison), four financing methods were identified in the survey.

The analysis of the financing methods was complicated by several factors: the actual purchase price of the machine varied depending on the method of finance used, as different discounts from the list price were available for each financial alternative; down payments and yearly repayments differed for the various financing methods, and the repayments could be spread over different time periods; effective interest rates varied between financing methods; and loan repayment terms could be tailored to suit individual farmer situations. As a result of these complications, it was not possible to determine the best financing method simply by examining the loan terms.

The first financing method identified was a loan from the financial subsidiary of the machinery manufacturer. The loan was based on a list price for the combine of $14,000. The down payment was $3,000 and the balance would be amortized over five years at an interest rate of 12.8 percent. The second loan was from a finance company that required a down payment of $2,700 on a quoted price of $12,200. The balance could be amortized over a period of up to seven years, with six years being chosen for the purposes of this analysis. The interest rate was 14.5 percent. The third alternative was a personal bank loan. The purchase price of $12,000 was the same as for cash. A down payment of 25 percent was required, with a four-year repayment period and an interest rate of 9 percent. The final alternative was a financial lease from a commercial leasing company, which would purchase the machine at the cash price, and lease it to the farmer at a monthly rate (payable yearly) of 2.3 percent of the purchase price. After five years, the farmer could retain the machine by paying one month's rental per year.

The four financing alternatives were analyzed using two computer programmes specifically written for the purpose. One programme was used for the cash purchase and loan financing alternatives, and the other was used to analyze the financial lease. All were analyzed in terms of net present value for a range of discount rates and tax rates.

The Empirical Results

The empirical results of the analysis are shown in Table 7. At low discount rates, cash purchase is the cheapest method of financing the investment in terms of net present value. As the discount rates increase, the personal bank loan becomes the best method of financing. Cash financing and the bank loan have a break-even discount rate between 7.5 and 8.5 percent, depending on the tax rate, i.e. the break-even discount rates are somewhat less than the loan interest rate, depending on the tax credit allowed on interest, which in turn, depends on the tax rate. At higher discount rates and high tax rates, the financial lease becomes the cheapest method of financing.

Trends in financing methods, with changing discount rates and tax rates, become much more apparent if replacement cycles for machines are introduced into the analysis (see Batterham and Blonde (5) for an analysis of tractor financing alternatives with various replacement cycles).

SUMMARY AND CONCLUSIONS

The objectives of this paper were to outline an economic model of farm machinery investment, and to extend the model so that various methods of financing the investment could be analyzed.

TABLE 7. NET PRESENT VALUE OF FINANCING ALTERNATIVES

Financing Alternative \ Tax Rate	15%	20%	25%	30%
Discount Rate 5%				
Cash	10545	10060	9575	9090
Machine Company Finance	14152	13378	12604	11830
Finance Company	13086	12358	11630	10902
Bank Finance	11108	10528	9947	9366
Financial Lease	12984	12220	11457	10693
Discount Rate 10%				
	15%	20%	25%	30%
Cash	10703	10271	9838	9406
Machine Company Finance	12728	12038	11348	10658
Finance Company	11545	10898	10251	9604
Bank Finance	10247	9727	9208	8688
Financial Lease	11224	10564	9904	9243
Discount Rate 15%				
	15%	20%	25%	30%
Cash	10833	10444	10055	9666
Machine Company Finance	11570	10949	10328	9707
Finance Company	10330	9749	9169	8588
Bank Finance	9524	9054	8595	8116
Financial Lease	9828	9250	8672	8094

The traditional method of analyzing farm machinery investment, using partial budgeting methods based on cost-curve theory, was considered and rejected on the grounds that the effects of the passage of time were not included in the analysis. Capital budgeting methods based on investment theory were then investigated and used to analyze a buy or custom hire decision for a combine. The results of the capital budgeting analysis indicate that the opposite decision should be taken to that indicated in the partial budgeting analysis, using the same data.

Capital budgeting methods were then used to analyze several methods of financing investment in a combine. The financing methods were identified from a survey. Computer programmes were written to calculate the net present value of costs of the various financing methods for many different discount and tax rates. It was shown that at high discount and tax rates, credit financing and financial leases may provide a cheaper method of financing investment than using cash.

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POLICY AND PROGRAM DEVELOPMENTS IN CANADA

CROP INSURANCE ACT

(Amendment for Ontario)

Further to section 3 of the Crop Insurance Act, Privy Council 1974 - 603; 19/3/74; "Canada" has given approval to enter into an Agreement with "Ontario" to provide for a federal contribution of 50 percent of the total premiums, provided that "Ontario" pays all the administrative costs; that "spot-loss" coverage for corn, white beans, soybeans, peas, sweet corn, onions, red beets and potatoes be included; and that changes be made in coverages and rates in such a manner as will keep the program self-sustaining.

(Amendment for Nova Scotia)

Further to section 3 of the Crop Insurance Act, "Canada" has given approval to enter into an Agreement with "Nova Scotia"; Privy Council 1974-523; 12/3/74; to provide for revisions of certain terms and conditions of the plans of insurance for spring grains, flue-cured tobacco, corn, peas and beans; to provide for re-insurance; and that coverages and rates in the corn, pea and bean plans be amended in such a manner as will keep the insurance scheme self-sustaining; and that lowbush blueberries be included as an insurable crop.

(Amendment for Saskatchewan)

Further to section 3 of the Crop Insurance Act between "Canada" and "Saskatchewan" the Agreement is amended; P.C. 1974-209, 12 February, 1974; to provide for a federal contribution of 50 percent of the total premium provided that the Government of Saskatchewan pays all the Administrative costs; that a 70 percent basic level of coverage for all insurable crops in addition to the 60 percent level of coverage is included; that "spot-loss" coverage for hail and/or fire losses is included; that a quality guarantee as well as a quantity is included; that sunflowers are included as an insurable crop; and that the schedule of coverages and premiums is amended in such a manner that in the opinion of the Department of Agriculture it will make the program self-sustaining.

(Amendment for Manitoba)

Further to section 3 of the Crop Insurance Act between "Canada" and "Manitoba" ...the Agreement is amended; P.C. 1974-208, 12 February, 1974; to provide for a federal contribution of 50 percent of the total premium provided that the Government of Manitoba pays all the administrative costs; that the schedule of coverage and premiums is amended in such a manner that in the opinion of the Department of Agriculture will make the program self-sustaining; and that an endorsement to provide "spot-loss" coverage for hail and/or fire losses be included.

(Amendment for Alberta)

Further to section 3 of the Crop Insurance Act between "Canada" and "Alberta" it is desirable to further amend the Agreement; P.C. 1974-210, 12 February, 1974; to provide for a federal contribution of 50 percent of total premium provided that the Government of Alberta pays all the administrative costs; that the schedule of coverage and premiums is amended in such manner that in the opinion of the Department of Agriculture will make the program self-sustaining; that sweet corn is included as an insurable crop; and that a hail endorsement to provide "spot-loss" coverage for hail losses will be included.

(Amendment for Prince Edward Island)

Further to section 3 of the Crop Insurance Act between "Canada" and "Prince Edward Island", Privy Council 1974..., the agreement is further amended to provide for a federal contribution of 50 percent of the total premiums, provided that the Government of Prince Edward Island pays all the administration costs; that rutabagas be included as an insurable crop; and that coverage and premium rates be changed in such a manner as will keep the insurance scheme self-sustaining.

CANADA GRAIN ACT

(Canadian Grain Regulations, Amendment)

Further to the Canada Grain Act, Chapter 7 of the Statutes of Canada, 1970-71, an amendment made on March 14, 1974 by the Canadian Grain Commission to the Canadian Grain Regulations... effective 15/4/74. The last increase in these tariffs was in 1951. Increased fuel costs have created the need for increased tariffs. The tariff charges for drying grain have been increased as follows: for all grain, except flaxseed, sunflower seed, rapeseed, domestic mustard seed and malting grades of barley; tought, per bushel 5¢; damp 20 percent moisture and under per bushel, $7^1/_2$¢; damp over 20 percent; moisture, per bushel, 9¢.

APPROPRIATION ACT

(Rabies Indemnification Regulations, Amended)

Further to Appropriation Act No. 4 of 1973, the Rabies Indemnification Regulations made by Order in Council, "Canada"; P.C. 1971-2272 of 2nd November, 1971; is revoked P.C. 1974-337, 26 February, 1974. The substitution is as follows:

Subject to sections 4 and 5, the Minister may reimburse any province two-fifths of the amount paid by the province to owners of animals that have died as a result of rabies. The maximum amount per animal that the Minister may pay under these Regulations is (a) for cattle, two hundred dollars; (b) for horses, one hundred and forty dollars; (c) for sheep, forty dollars; (d) for swine, forty dollars; and (e) for goats, forty dollars; no payment shall be made by the Minister under section 3 in respect of any animal unless the Minister has first received a certificate signed by a veterinary inspector under the Animal Contagious Diseases Act certifying that the animal died as a result of rabies.

CANADA AGRICULTURAL PRODUCTS STANDARDS ACT

(Lamb and Mutton Carcass Grading Regulation, Amended)

Further to the Canada Agricultural Products Standards Act, Lamb and Mutton Carcass Grading Regulations made by Order in Council P.C. 1958-1058 of 31st July, 1958, are revoked and P.C. 1974-335, 26 February, 1974 are substituted.

These Regulations may be cited as the Lamb and Mutton Carcass Grading Regulations. There shall be seven grades for lamb carcasses with the grade names: Canada A1; Canada A2; Canada A3; Canada A4; Canada B; Canada C1; and Canada C2.

There shall be five grades for mutton carcasses with the grade names: Canada D1; Canada D2; Canada D3; Canada D4; and Canada E.

The Minister may assign graders to establishments and designate the times at which carcasses may be graded. See P.C. 1974-335, 26/2/74 for complete details - a total of 12 typewritten pages.

ANIMAL CONTAGIOUS DISEASES ACT

(Animal Contagious Diseases Regulations, Amended)

Further to section 3 of the Animal Contagious Diseases Act, the Animal Contagious Diseases Regulations made by Order in Council; P.C. 1954-1968 of 16th December, 1954; are amended; P.C. 1974-522, 12/3/74; as follows;

Section 16 of the Animal Contagious Diseases Regulations is revoked and the following substituted therefore:

(1) Subject to subsection (2), no person shall import into Canada honeybees from any country other than the United States

(2) A person may import honeybees into Canada from a country other than the United States if

(a) the Minister issues a permit for their importation; and

(b) the honeybees are shipped direct to Canada from the country in which they originated.

(3) No person shall import into Canada

(a) honeybees on combs;

(b) used hives or used hive equipment;

(c) beeswax, unless accompanied by a declaration of the shipper that the beeswax has been liquified; or

(d) honeybees in combless packages unless the packages are accompanied by a declaration of the shipper that the food supplied to the bees and carried in the package does not contain honey.

AGRICULTURAL PRODUCTS STANDARDS ACT

(Honey Regulations, Amended)

Further to the Canada Agricultural Products Standards Act, the Honey Regulations made by Order in Council P.C. 1967-1779 of 21st September, 1967, are amended; P.C. 1974 - 587; 12/3/74; with regard to a variety of matters including containers, labels, standards of quality, standards of color, grades, operation of honey plants, conditions under which honey may be imported and the composition requirements for certain kinds of honey.

CANADIAN TURKEY MARKETING AGENCY

The Canadian Turkey Marketing Agency was officially established December 18 under the federal Farm Products Marketing Agencies Act. All provinces signed a federal-provincial agreement. The provinces of Newfoundland, New Brunswick and Prince Edward Island do not have turkey boards in operation and are therefore designated as the unregulated area. These provinces will participate more fully in the national plan when their turkey boards or similar marketing organizations become operational.

It is hoped that the plan will assist orderly marketing for producers, provide adequate supplies of high quality turkey meats to consumers at fair prices, and help develop both domestic and export markets.

The agreement recognizes both federal and provincial jurisdictions. Initial members of the Agency are John de Graaf of Port Williams, N.S., Roger Landry, St-Valère, Que., Eugène Mailloux, Amherstburg, Ont., John Tanchak, Ridgeville, Man., Julius Pulvermacher, Bruno, Sask., Murray Brown, Acme, Alta., and Donald Bladon, Haney, B.C.

BRIEFS ON TARIFFS AND TRADE

Procedure for all Canadian interests submitting briefs on the development of Canadian negotiating objectives for the forthcoming GATT negotiations (tariffs and trade), as originally announced in November 1973: Briefs should be submitted as soon as possible in 15 copies, prefaced if possible with a brief summary of the content. It would be helpful if those wishing to supplement their written briefs with oral presentations would provide advice to that effect when briefs are submitted. Send briefs to the Secretary, Canadian Trade and Tariffs Committee, Room B2-135, Lester B. Pearson Building, 125 Sussex Drive, Ottawa, K1A 0H5, Ontario (telephone 996-8291).

BEEF QUALITY PREMIUM PROGRAM (BEEF SUBSIDY)

The Federal Government's premium on top quality beef became effective on March 18, following the announcement on March 15 by Agriculture Minister Eugene Whelan.

The premium is being paid on Canadian cattle slaughtered for Canadian consumption on or after March 18, which grade Canada A1, A2, A3 or A4. The premium is $7.00 per hundredweight live, and is based on 57 percent yield for steers and 56 percent yield for heifers or $12.25 per hundredweight on steers and $12.50 per hundredweight on heifers dressed equivalent warm weight.

The premium applies to Canada A1 and A2 until the termination of the program, to Canada A3 to April 13, 1974, and to Canada A4 to April 6, 1974. Effective April 8, 1974, only Canada A1, A2 and A3 received the quality premium. On and after April 15, the premium applied to Canada A1 and A2 only.

The premium program will be phased out gradually when the cattle market returns to normal.

Objectives of the program as outlined by Mr. Whelan are: to ensure top quality beef for the consumer, to prevent the price of beef to the consumer from rising, to tide cattlemen over a period when many could become bankrupt, and to assure Canadian customers of a continuing supply of beef in the future.

Shortly after the premium plan became effective, Agriculture Minister Whelan announced a change in the system of payment to meet complaints that difficulties were being encountered in determining the grade of animals. On April 1 the Government undertook to pay a premium of 5 cents per pound on all Canadian cattle marketed for immediate slaughter falling within Grades A, B and C. The program originally provided a 7-cent payment on Grade A cattle only.

PUBLICATIONS

ECONOMICS BRANCH PUBLICATIONS

Available from the Economics Communications Unit, Agriculture Canada, Ottawa, K1A 0C5

A Working Paper on Production Practices, Costs and Returns in Quebec Grain Corn Production. Montreal, 1973. 36 p. Publ. No. 73/10. Free.

A Working Paper on Sheep Production in the Eastern Townships (Quebec). A federal employment stimulation project. December 1973. 49 p. Tables. Publ. No. 73/18. Free.

Handbook of Food Expenditures, Prices and Consumption. Zuhair A. Hassan. Bilingual. 79 p. Publ. No. 73/20. Free.

A Working Paper on Use of Short-term Credit by Quebec Farmers. A federal employment stimulation project. November 1973. 43 p. Tables, charts, map. Publ. No. 73/23. Free.

Agricultural Economics Research Information System. Report 4. Annual information on research projects in Canada as of May 1973. December 1973. 29 p. Tables. Publ. No. 73/24. Free.

Structural and Technological Change in the Dairy Industry. R.K. Sahi. June 1973. 130 p. Tables, charts. Publ. No. 73/21.

OTHER PUBLICATIONS

Canadian (Palliser) Grain Producers Mission to Japan and Southeast Asia. Report. Regina 1973. 38 p.

Marketing Can Milk in Ontario. S.H. Lane. Guelph 1973. 21 p. Illus. Publ. No. 73/15.

A Case of Eggs. Report of Study of Newfoundland Egg Industry. Gordon A. MacEachern and Anne McLean Bullen. Ottawa 1973. 114 p. Illus.

IN REPLY

The view of the reader is an essential part of effective publishing. I believe editors and authors must have the views from at least some readers in order to obtain reader reaction, and to provide more relevant articles in the most acceptable way.

We are grateful to the readers who take the time and the bother to reply. - Managing Editor.

Mr. Tom Brown, an agrologist, Stony Plain, Alberta, commenting on articles in the October 1973 issue, ranks the first, on Canada's beef and veal trade, at 9 on the value scale, that on hog production at 8, and the one on milk quotas at 3. He likes the graphs and tables used in the first and second, and the plan for further study contained in number two. The latter article, on hog production in the prairie provinces, he feels "will be useful reference at meetings and during individual contacts".

Mr. R.J. Pieh, a teacher-farmer in Kingston, Ontario, comments on the first October article "Changing Economic Profile of Canada's Beef and Veal Trade"; "It gave me a better understanding of the beef export picture". He rates the article at $7^1/_2$, and adds that the listing of publications is a great help.

Mr. James G. Young of Lloydminster, Alberta, a farm-management technician, tells us he found "the first meaningful figures I have seen on rapeseed production costs" in the third article of the August 1973 issue, "Rapeseed Production Costs in Canada".

Mr. Damase Limoges, an agronomist in St. Lambert, Quebec, says he finds the publication very interesting and wants to continue receiving it.

Mr. Jean-Paul Houle, a county agronomist of L'Assomption, Quebec, comments on the first article in the August issue; "According to the 1971 census, the three major agricultural productions are, in order of cash returns, livestock breeding, milk production and wheat. Due to its side effects on the economy, I believe that the milk industry is the most important production, and I would like you to give it first priority in Canadian Farm Economics".

Mr. Stephen Peloquin, an agronomist at Ste. Foy, Quebec, comments on articles one and two of the October issue, dealing respectively with Canada's beef and veal trade and hog production in the prairie provinces. He says he finds these "topical subjects, treated objectively".

Mr. Bertaud Belzile of the province of Quebec's Office of Planning and Development writes: "Canadian Farm Economics in my opinion is an effective agent of analysis and of publication of questions concerning primary and secondary agriculture, as well as government legislation. Its contents deal with macro-situations which are always studied in a total perspective, thus bridging the gap between administration and disciplines dealing with agriculture. It seems to me that you should continue in this direction, since there are already a number of purely technical and specialized publications".

IN REPLY TO AUTHORS AND EDITORS REGARDING APRIL 74
CANADIAN FARM ECONOMICS

I have read the following article(s):

(1) Ontario Grain Corn Marketing.
(2) Canada's Oilseed Sector– An Overview of Marketing and Trade
(3) An Economic Analysis of Grain-Beef Cattle Farms in the Lloydminster Battleford Area, Saskatchewan, 1972
(4) Analysis of Machinery Investment and Financing Using Capital Budgeting

My comments are on article number

This article was: not useful 1 2 3 4 5 6 7 8 9 10 very useful.

Because (e.g., The most important economic and social factors were studied. The work was well documented and the conclusions were useful to me).

Beefs Bouquets (Suggestions to authors, publications committee and editors)

My comments may ( ) may not ( ) be used in a future issue of this publication if the editor wishes.

NAME (Please print) . . . . Occupation . . . .

ADDRESS . . . .

Please place this sheet in an envelope and address it to:

IN REPLY,
Att: John McConnell,
Economics Branch,
C.D.A., Sir John Carling Building,
OTTAWA, Ontario, K1A 0C5

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VOLUME 9 NUMBER 3 JUNE 1974

CANADIAN FARM ECONOMICS

HON. EUGENE WHELAN, MINISTER — S.B. WILLIAMS, DEPUTY MINISTER

Canada Dept of
Agriculture Canada
Economics Branch

Canadian Farm Economics is published bi-monthly by the Economics Branch, Canada Department of Agriculture, Sir John Carling Building, Ottawa, and is based on material prepared by economists of the Economics Branch.

Purpose: To provide current information on agricultural economics for economists, representatives of extension, education, press, agri-business, trade, foreign offices, bio-physical and social science researchers, administrators, librarians and leading farmers.

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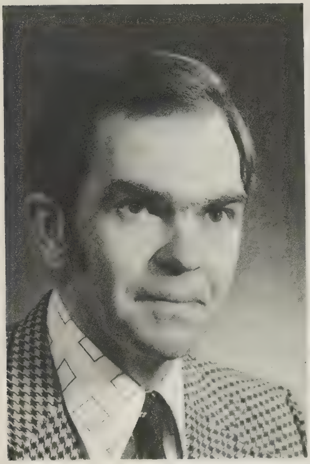
Letters from readers: Letters are encouraged and should be addressed to the author or the Managing Editor. Responses . . . comments, suggestions and points of view are important for effective two-way communications. Letters may be used in the following issue of CFE and will be edited prior to publication where necessary.

NEW BRUNSWICK AGRICULTURE - AN OVERVIEW



D.M. Byers*

Between 1956 and 1973, gross farm income in New Brunswick rose from $48 million to $94 million with potatoes the largest earner.

The province remains in a deficit position for many commodities, but increased production will occur only through such incentives as reasonable prices, income stability, and favorable government policy.

INTRODUCTION

A dramatic change in New Brunswick agriculture has occurred over the last 25 years, with significant labor, capital and land use adjustments. Farms are becoming more commercialized, specialized and are relying more on capital intensive technology. Improved crop and livestock technology plus capital substitution for labor have increased farm labor productivity. The most dramatic example of increased productivity is the case of potatoes.

GROSS FARM INCOME

In 1972 the gross farm income from agricultural production in New Brunswick was $63.3 million[1]. The Atlantic Provinces Economic Council estimated that in the same year the province's gross product was $2,146 million[2], indicating that the farm sector of the agricultural industry contributes about 3 percent of the gross provincial product. During the 15-year period, 1956 to 1971, gross farm income fluctuated between $48 million and $65 million annually, with only a slight upward trend noticeable. However, the 1973 figure was $94 million, a very unpredictable year, and there is a forecast of an 8-percent increase for 1974 over 1973[3].

During the last quarter century there have been significant labor, capital and land use adjustments. As the number of farms declined, size of remaining farms increased, farm labor force dropped and the capital investment per farm increased. In 1971 there were 5,485 census farms claiming 1.3 million acres for an average size of 244 acres (Tables 1 and 2). Average capital investment per commercial farm in 1971 was more than $31,500 per unit. In 1961 farms with sales less than $1,200 per year represented 56.4 percent of the total number of census farms, and received 8.8 percent of the total sales. In 1971 these small farms made up only 36.4 percent of the total number of farms and generated 1.9 percent of total sales. The number of small farms (sales of less than $1,200 by Census definition) is declining at a faster rate than the total number of farms (Table 3).

VOLUME OF PRODUCTION

Despite the decrease in farm numbers, farmland area and labor force, the volume of production in the province has been maintained, and in the case of some commodities, even increased. Improved crop and livestock technology plus capital substitution for labor have increased farm labor productivity. In the period 1945 to

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*Dr. D.M. Byers is with the Research Division, Economics Branch, Agriculture Canada, Atlantic Regional Office, Truro, N.S.

[1] Statistics Canada, Cat. No. 21-202.

[2] Office of the Economic Advisor, Province of New Brunswick.

[3] Agriculture Situation Outlook, 1974.

TABLE 1. NUMBER AND AREA OF CENSUS FARMS, NEW BRUNSWICK, 1966 AND 1971

	Number of Farms			Area		
	1966	1971	% Change	1966	1971	% Change
	number			acres		
New Brunswick	8,706	5,485	−37.0	1,811,695	1,339,133	−26.1
Albert	227	154	−32.2	55,020	46,609	−15.3
Charlotte	187	119	−36.4	36,806	21,774	−40.8
Gloucester	738	365	−50.4	97,587	53,691	−45.0
Kent	782	401	−48.7	138,097	86,194	−37.6
Northumberland	512	215	−58.0	69,341	32,892	−52.6
Restigouche	363	205	−43.5	64,271	43,002	−33.1
Westmorland	1,072	647	−39.6	220,457	160,073	−27.4
St. John River Basin						
Carleton	1,152	810	−30.0	283,341	234,339	−17.3
Kings	1,036	793	−23.5	238,499	203,030	−14.9
Madawaska	603	368	−39.0	129,358	96,435	−25.5
Queens	399	279	−30.1	94,687	74,661	−21.1
St. John	71	36	−49.3	19,837	6,532	−67.1
Sunbury	203	133	−34.5	53,368	39,563	−25.9
Victoria	547	414	−24.3	116,933	96,247	−17.7
York	814	546	−32.9	194,093	144,091	−25.8
River Basin Total	4,825	3,379	−30.0	1,130,116	894,898	−21.0
St. John River Basin as a Percent of New Brunswick	55%	61.6%		62.4%	66.8%	

Source: Census of Agriculture — 1966 and 1971.

TABLE 2. AVERAGE SIZE OF CENSUS FARMS, NEW BRUNSWICK, 1966 AND 1971

	Size of Farm		Percent Change
	1966	1971	
	acres		percent
New Brunswick	208.1	244.1	17.3
Albert	242.4	302.7	24.9
Charlotte	196.8	183.0	− 7.0
Gloucester	132.2	147.1	11.3
Kent	176.6	214.9	21.7
Northumberland	135.4	153.0	13.0
Restigouche	177.1	209.8	18.5
Westmorland	205.7	247.4	20.3
Carleton	246.0	289.3	17.6
Kings	230.2	256.0	11.2
Madawaska	214.5	262.1	22.2
Queens	237.3	267.6	12.8
St. John	279.4	181.4	−35.1
Sunbury	262.9	297.5	13.2
Victoria	213.8	232.5	8.7
York	238.4	263.9	10.7
St. John River Basin	234.2	264.8	13.1

Source: Census of Agriculture — 1966 and 1971.

1947 one farm worker in Canada fed about 17 persons, while in the years 1970-72 the same worker supported 49 consumers. A similar trend occurred in New Brunswick. Another trend can also be seen there as agricultural output shifts to the St. John River Basin. The most dramatic example of this is the case of potatoes. In 1941 the Basin produced about 61 percent of the province's total potato crop, but by 1971 more than 97 percent of the provincial production was coming

TABLE 3. CENSUS FARMS CLASSIFIED BY SALES UNDER $1,200, NEW BRUNSWICK, 1961, 1966 AND 1971

		Census Farms — Sales Under $1,200		
Year	Total Number Census-Farms	Number	Percent All Farms	Percentage of Total Sales of All Census Farms
1961	11,786	6,642	56.4	8.8
1966	8,706	4,287	49.2	4.4
1971	5,485	1,999	36.4	1.9

Source: Census of Agriculture — 1961, 1966 and 1971.

from the Basin. Other crops show similar but less rapid trends. Livestock production also has exhibited a steady shift toward the Basin in terms of percentage of provincial output.

The food and feed balance sheet for the province indicates a deficit for most farm commodities. Estimates of the major commodities are presented in Table 4 to show the production, estimated provincial requirement, and the deficit or surplus situation which existed. A projection of requirement is made to 1981 based only on the expected increase in provincial population, assuming present per capita consumption remains the same. Most of these commodities have a positive income relationship which will tend to raise the requirement levels further as per capita income increases. Some of the deficit commodities are shown in terms of the production equivalents which would represent the deficit values.

The estimates presented in Table 4 are not intended to suggest that deficit needs should or can be met through increased New Brunswick farm production. The answer to this question lies with individual farmers who are motivated by comparative net returns, income stability, acceptance of risk, and by the public sector, represented by government, which provides added incentives or disincentives through various policy means. In some cases New Brunswick farmers have a comparative advantage over farmers in other areas for farm production - fluid milk, poultry, potatoes, blueberries, strawberries and certain processing crops - under the present cost and market structure. Other commodities are marginally competitive with outside sources - pork, beef, turkey meat, apples - while lamb and wool, feed grains, and manufacturing milk offer no comparative advantage under present cost and marketing circumstances.

POTATOES

Potato production is the single most important contributor to the gross farm value of New Brunswick agriculture. Sales of table stock processing and seed potatoes contribute more than 25 percent of the province's gross farm income. Production of the crop tends to be specialized as a result of favorable soil and

TABLE 4. FOOD AND FEED BALANCE, NEW BRUNSWICK, 1971 AND 1981

Commodity	Unit	Requirement 1971	Production 1971		Deficit or Surplus 1971	Deficit Equivalent 1971	Requirement 1981**	Deficit or Surplus (over 1971 production) 1981**
			unit	percent				
Deficit:								
Pork	000 lb.	37,693	11,603	31	26,090	197,600 hogs @ 132 lbs.	39,798	28,195
Beef	000 lb.	46,957	13,055	28	33,902	72,000 head @ 471 lbs.	49,513	36,458
Veal	000 lb.	2,284	1,455	64	829	7,895 head @ 105 lbs.	2,345	890
Mutton & Lamb	000 lb.	1,650	482	29	1,168	27,809 head @ 42 lbs.	1,742	1,260
Chicken & Fowl	000 lb.	19,925	14,439	72	5,486	1,769,677 birds @ 3.1 lbs.	20,971	6,532
Turkey Meat	000 lb.	3,934	530	13	3,404	400,471 birds @ 8.5 lbs.	4,087	3,557
Eggs	000 doz.	12,754	8,080	63	4,674	233,700 birds @ 20 doz.	42,880	5,616
All Milk	000 lb.	574,000	257,729	45	316,271	31,627 cows @ 10,000 lbs.	606,015	348,286
Manufactured Milk	000 lb.	438,000	95,626	22	342,374		462,434	366,808
Butter (milk equiv.)	000 lb.	7,170*	2,993	42	4,177		7,504	4,511
Cheddar Cheese (milk equiv.)	000 lb.	1,878*	442	24	1,436		1,943	1,501
Vegetables	000 lb.	101,529	18,089	18	83,404		107,133	89,044
Apples (fresh)	000 lb.	17,895*	17,400	97	495	62 acres @ 8,000 lbs.	18,894	1,494
Grain	tons	171,820	65,227	38	106,593	106,637 acres @ 50 bu.		
Surplus:								
Potatoes	000 cwt.	1,079	13,092	1,213	12,013		1,139	11,953
Blueberries	000 lb.	1,650	4,800	291	3,150		1,742	3,058
Strawberries	000 qts.	1,269	1,734	137	465		1,340	394

*Food Expenditure Survey Estimate — Family Food Expenditure in Canada, 1969, D.B.S., Information Canada, Ottawa, 1971.
**No income effect is assumed.

climatic conditions, and a high degree of mechanization and capitalization necessary to produce the crop.

New Brunswick potato acreage has increased gradually over the last 15 years. There has been some fluctuation due mainly to price expectation decisions but in the last few years 60,000 acres or more have been grown (Table 5). The area of potatoes in 1972, however, fell to 53,000 acres following several years of relatively low prices. There is an increasingly heavy concentration of potato production in the St. John River Basin, mainly due to significant increases in Victoria and Carleton Counties and declining production outside the River Basin. In 1971, 97 percent of the potato acreage was in the Basin as compared to 61 percent in 1941 (Table 6). This is partly due to favorable soil and growing conditions in the Basin, and also to the growth of the processing facilities in the Upper St. John River Valley. In 1971 the acreage of potatoes grown in the Basin was 57,700 acres, more than twice that grown in 1941 (27,000 acres). In the last decade the area of productive potato land in the Basin has increased by about 10,000 acres.

TABLE 5. POTATO ACREAGE, PRODUCTION AND FARM VALUE, NEW BRUNSWICK, 1960 TO 1972

Crop Year	Acres	Yield per Acre	Production	Average Farm Value per Cwt.[1]	Farm Value[1]
	No.	Bu.	'000 cwt.	$	$'000
1960	50,000	174.0	8,700	1.45	12,615
1961	54,200	188.0	10,162	0.88	9,004
1962	50,000	213.8	10,690	1.25	13,362
1963	53,000	204.0	10,828	1.40	15,159
1964	54,000	215.0	11,610	2.85	23,917
1965	57,000	198.0	11,280	2.20	24,816
1966	64,900	222.7	14,450	1.05	13,657
1967	62,000	203.0	12,585	1.31	13,953
1968	61,000	226.0	13,785	1.05	12,656
1969	64,000	206.3	13,206	1.95	21,853
1970	61,000	215.0	13,118	1.45	16,470
1971	59,421	235.1	13,971	1.20	14,728
1972	53,000	231.1	12,246	2.74	29,299

[1] Value of Marketable Product Only, 1966-72.
Source: Statistics Canada, Regional Office, Truro, N.S.

The volume of potatoes produced in New Brunswick increased gradually from 1956 to a peak of 14.45 million cwts. in 1966 (Table 5). Since then production levelled off at about 13 million cwts. until 1972 when only 12.25 million cwts. were produced. More than 95 percent of the provincial production comes from the St. John River Basin area.

Table stock, processing and seed markets remain the main outlets for New Brunswick growers (Table 7); in 1971 these were 33, 38, and 16 percent, respectively, of

TABLE 6. ACREAGE OF POTATOES ON CENSUS FARMS, NEW BRUNSWICK, 1941 TO 1971

	1941	1951	1956	1961	1966	1971
				acres		
New Brunswick	44,092	51,234	46,190	54,165	64,901	59,421
Madawaska	3,020	4,984	5,851	8,196	10,349	9,851
Victoria	8,865	14,010	13,797	20,601	25,037	22,802
Carleton	9,263	15,546	13,366	16,577	23,285	24,186
York	2,196	2,316	1,645	1,186	1,007	328
Sunbury	599	587	410	370	150	86
Queens	1,164	811	503	433	360	200
Kings	1,514	967	809	548	449	210
St. John	370	208	135	110	163	13
St. John River Basin	26,991	39,429	36,516	48,021	60,802	57,676
River Basin as Percent of Total	61.2	77.0	79.1	88.7	93.7	97.1

Source: Census of Agriculture for years noted.

TABLE 7. POTATOES: PRODUCTION, IMPORTS, UTILIZATION IN NEW BRUNSWICK, CROP YEARS 1957-58 TO 1971-72

	Average 1957-58 1960-61	Average 1961-62 1965-66	1966-67	1967-68	1968-69	1969-70	1970-71	1971-72
				(million cwt.)				
Production[1]	8.388	10.914	14.450	12.585	13.785	13.206	13.118	13.971[2]
Imports[1]	.008	.006	.009	.007	.006	.006	.008	.009
Supply	8.396	10.920	14.459	12.592	13.791	13.212	13.126	13.980
Table & Seed[3] Shipments (Exp. & Domestic)	5.737	6.571	5.523	5.867	6.241	6.241	5.423	5.095
Local Consumption[3]	.699	.800	.902	.926	.925	.884	.928	.926
Seed Use in N.B.	.415	.595	.919	.920	.825	.805	.785	.832
Processing,[3] Starch, Shrink, Waste, Feed	1.474	2.649	6.593	4.875	5.794	5.232	5.982	7.094
Total Utilization	8.325	10.615	13.937	12.588	13.785	13.162	13.118	13.947

[1]Source: Crop and Seasonal Price Summaries, Fruit & Vegetables, Part 2, 1957-58 to 1970-71, Market Information Division, P. and M. Branch, C.D.A.

[2]Source: Field Crop Reporting Series – No. 19, page 7, Statistics Canada, October 4, 1972.

[3]Source: Potato Disposition, New Brunswick, Market Information Division, P. and M. Branch, C.D.A., Ottawa, Oct. 2, 1972.

[4]Note: Data on "Potato Disposition" not available for 1956-57, first average is a 4-yr. average.

[5]Note: Tables on Potato Disposition vary. Only starch and shrinkage figures available for 1962 to 1965, while starch, shrink and waste are available for 1961 and 1966-72. Unbalance of supply figures and total utilization figures are due to these differences in tables.

the total crop disposition. The remainder of the crop was attributed to shrinkage, livestock feed, and other losses. Central and Eastern Canada, the U.S.A., the Caribbean and some other offshore exports have been the traditional markets for New Brunswick potatoes.

Approximately 30 percent of the 1971 potato crop was sold as table stock, with most of this product going outside the province to Central and Eastern Canadian markets, and with exports to the U.S.A. and other countries. Provincial table stock requirements amounted to 925,220 cwts., while 3,247,855 cwts. were shipped out of the province. Based on this apparent disappearance, consumption per capita of table stock in New Brunswick was about 146 pounds. This agrees favorably with the food Expenditure Survey[4] figure of 144 pounds

[4]Family Food Expenditure in Canada, 1969, D.B.S. Pub. No. 62-531, Information Canada, 1971.

per capita for all classes of population in the Atlantic Provinces. Studies in the U.S. and Canada have shown that there is a negative income effect for table stock demand. With the rising disposable income per capita in North America the demand for table stock during the post war years has decreased. It has been offset to some extent by increasing population. The market (aggregate continental) outlook for potatoes in a "direct" consumption form, however, is not optimistic.

Table stock potatoes from New Brunswick are sold mainly in the Canadian and U.S. markets, and in some Caribbean Islands. These are very competitive markets, with U.S. and P.E.I. production competing for shares in all these areas. New Brunswick table stock sales have been declining in absolute terms. The Central Canada market has shown a preference for the P.E.I. product. Shipments of New Brunswick table stock to the Central and Eastern markets have dropped from 7 million cwts. in 1959-60 to 3.7 million cwts. in 1971-72. Sales to the U.S. market have also fallen off in the past few years. The U.S. market has very quickly become the major export outlet for N.B. table stock. While in 1962 only 1 percent of exports out of Canada were sold to the U.S., in 1970 more than 96 percent went to that market. In 1971 about 66 percent went to the U.S. market.

Export sales to other than U.S. markets have fallen off from 197,400 cwts. in 1966-67 to 7,700 cwts. in 1970-71. They amounted to 52,400 cwts. in 1971, as a result of a 51,559 cwts. sale to Argentina. There has been a decline in regular markets in Bermuda, the Bahamas, Jamaica, the Barbados, Puerto Rico, and other West Indian Federations. There have been sporadic sales to Italy, South America, Belgium, West Germany, St. Pierre and other countries. The result indicates that there is an increasing relative dependence on the U.S. market for table stock exports, while total shipments to export markets have declined sharply.

The potato processing industry is an important market outlet for potatoes in New Brunswick. In 1971 an estimated 5.3 million cwts. of the crop (38 percent) was used for local processing into edible food products, such as french fries, dehydrated products, chips and starch. Potatoes sold for starch are generally culls, sold for 30 to 40 cents per cwt. or they are potatoes bought by the Agricultural Stabilization Board during low price periods. This occurred during the 1971-72 season when such potatoes were purchased at about $1.50 per cwt. At the normal starch price farmers do well to cover their transportation costs to the starch plants, so this is not a viable market alternative to the grower, except as a means to dispose of cull potatoes.

Processing of potatoes for other food products has been of growing importance to N.B. potato growers and, with declining table stock and seed sales, has provided an alternative market unavailable until the 1960's. This outlet was so good in the early 1960's that New Brunswick production of potatoes increased despite falling markets for the fresh product.

Potato sales for seed stock represent another market outlet for N.B. potato growers. Just over 10 percent of the 1971 crop or 1.4 million cwt. was sold for seed in Canada, the United States, South America, Caribbean Islands and other countries; about 6 percent of the total crop was used for seed in New Brunswick. The total seed disappearance was 2.26 million cwts. in 1971. Sales of seed tend to fluctuate yearly depending on the world supply and the market for table stock; in the past ten years total sales of seed have fluctuated between 1.1 and 1.7 million cwts. with exports accounting for at least 80 percent of the sales.

DAIRY

In its report, the Royal Commission on the Milk Industry in New Brunswick[5] (1971) described the New Brunswick dairy industry as a "very complex business" and "an industry that is confounded with contradictions". One of the most obvious contradictions is that raw milk for fluid and manufacturing purposes is purchased at prices over a range of at least $4 per cwt. While the fluid milk shipper, who receives the highest average price, has become the backbone of livestock agriculture in the province, the manufacturing milk producer is beating a hasty retreat out of the province's industry. There are a few industrial milk shippers left which are insufficient to support a viable manufacturing industry. In a relatively short time the milk industry has concentrated on meeting its fluid milk requirements, allowing more and more of its processed product needs to be met by imports from other provinces.

In 1972 New Brunswick dairy farmers produced 248 million pounds of milk (Table 8). Of this amount 137,827 was required to meet fluid sales needs while the remainder was used for processed dairy products and home use on farms. Manufacturing milk use was as follows: butter, 2,801,000 pounds; cheddar cheese, 470,000 pounds; and other factory products, 21,680,000 pounds (milk equivalent).

While fluid milk requirements were almost entirely met, it is estimated that less than 45 percent of the total milk

[5] **Report of the Royal Commission on the Milk Industry in New Brunswick, N.B. Department of Agriculture and Rural Development, Fredericton, 1971.**

TABLE 8. MILK PRODUCTION, UTILIZATION AND FARM VALUE, NEW BRUNSWICK, 1961 TO 1972

Year	Used in Factories	Fluid Sales	Otherwise Used	Total Milk Production	Farm Value	Average Farm Value per Cwt.
	–	'000 pounds		–	$ '000	$
1972	92,393	137,827	17,791	248,011	12,803	5.16
1971	95,615	135,540	26,563	257,718	12,077	4.69
1970	109,701	132,834	29,959	272,494	12,104	4.44
1969	122,879	136,440	31,892	291,211	12,218	4.20
1968	115,421	142,871	31,900	290,192	12,272	4.23
1967	128,588	150,686	33,153	312,427	12,671	4.06
1966	140,264	152,348	34,338	326,950	12,642	3.87
1965	156,108	154,165	36,613	346,886	12,917	3.72
1964	172,387	151,232	39,893	363,512	13,256	3.65
1963	170,632	152,747	43,821	367,200	12,835	3.50
1962	186,583	153,980	50,839	391,402	13,466	3.44
1961	201,618	152,892	53,930	408,440	13,870	3.40

Source: Statistics Canada, Regional Office, Truro, N.S.

needs of the province was met by provincial producers; only 22 percent of manufacturing milk product demand was satisfied from within the province.

In terms of dollar value the dairy sector of the agricultural industry, consisting of 2,800 farms, contributes just over 16 percent of the gross farm value. In 1972 the farm value of this milk has averaged about $12.8 million or about $5.16 per cwt. The St. John River Basin produces about 65 percent of the total provincial production, up from 55 percent in 1951, indicating the shift in geographic location.

The large gap between manufacturing milk supplies and consumption is growing, so that the 1971 total milk deficit of 316 million pounds per year (Table 4) will be close to 400 million pounds by 1981. Production continues to decline in the manufacturing milk sector and demand for milk products expands, due mainly to the population increase. Given the present technology trends, costs of production and milk marketing structure, fluid milk production will continue to dominate the New Brunswick dairy industry. In this sector production needs will still be met by fewer farms as units keep enlarging and milk production per man becomes greater. At present there are 11 processing plants and two distribution centres in the St. John River Basin. It is expected that these will soon be reorganized to about five distribution centres. This will mean a greater concentration of milk processing in St. John. The higher transportation costs for raw and processed milk, however, will be offset by the lower processing costs in the larger plants. A similar consolidation and amalgamation trend is occurring in the rest of the province.

BEEF

New Brunswick livestock sales account for about 14 percent of the value of agricultural production. In 1972 these sales amounted to $10 million (Table 9) with about 60 percent of the province's beef production coming from the St. John River Basin.

TABLE 9. COMMERCIAL MARKETING OF CATTLE AND CALVES, NEW BRUNSWICK, 1961 TO 1972

Year	Cattle	Calves	Farm Cash Receipts Cattle and Calves
	No.	No.	$ '000
1972	16,970	4,624	10,136
1971	13,362	4,968	7,672
1970	12,858	4,627	8,619
1969	9,356	3,459	7,666
1968	8,518	5,209	7,413
1967	10,575	6,904	7,882
1966	14,300	12,262	7,463
1965	17,026	10,824	6,875
1964	13,070	8,019	6,441
1963	7,746	8,430	5,657
1962	10,400	12,913	6,773
1961	8,774	11,969	5,787

Source: Statistics Canada, Atlantic Regional Office, Truro, N.S.

Most of the beef produced in the area in the past was a by-product of the dairy industry. As in the other Atlantic Provinces, there were very few specialized beef farms in New Brunswick. When production was not associated with a dairy operation, the beef enterprise on a farm was generally supplementary to another such as cash crops, poultry and hogs. This situation still exists,

although there is evidence to indicate that the size of the beef enterprise is increasing and the number of farms producing beef is declining.

Time series data[6] indicates that the breeding herd of beef cattle in relation to the dairy herd is increasing. Whereas the proportion of heifers and cows two years and over kept for beef to the number kept for milking was 1 to 20 in 1951, in 1971 the ratio was one to two. However, during the same 20-year period the total breeding herd dropped from 86,208 head to 54,398. The beef herd has increased absolutely while the dairy herd has declined. The former was 17,900 head in 1971, compared to 3,850 in 1951. This does not indicate that more livestock are available for slaughter, since the data may reflect a reclassification of cattle by type, i.e. the shift in emphasis from dairy to beef type animals, or dairy cows bred to produce crossbred calves for beef production. The important trend is that the total breeding herd is declining and total cattle marketings in the province also show a downward trend.

An important influence of the past predominance of dairy type animals being a source of calves for beef is the fact that the beef produced in New Brunswick follows the Atlantic Provinces' pattern for low grades. In 1971 the cattle of New Brunswick origin marketed through inspected plants graded 22.7 percent in the top three grades. More than 28.3 percent were graded "manufacturing". Comparable figures for Canada for the same year were 70.4 and 10.4 respectively. There has been some improvement in the grading performance of New Brunswick cattle over the past few years which is evidence of more specialized beef production.

The market for beef in New Brunswick is a local one with finished cattle and veal calves being sold to buyers at the farm, local butchers, or to packing plants located in St. John, Frederiction, Moncton, Paquetville, Campbellton and Keswick. It is estimated by Agriculture Canada personnel responsible for grading and inspection that about 50 percent of the cattle sold in the province are on a rail graded basis through a packer. The local butcher is an important market for beef, particularly the poorer quality cattle. However, even local butchers are having to seek out better quality cattle in order to compete with the larger chain stores which emphasize higher grade cuts.

New Brunswick cattle marketings during late 1971 and 1972 have been up considerably due to a feedlot operated in the Florenceville area, with a feed source based mainly on potato processing waste. It is estimated that there is a potential for 10,000 head being fed on the waste from the potato processing plant; further experience and development may show this to be a low cost source of cattle feed for the province.

The livestock auction sales at Sussex and Florenceville have become an important sales outlet for cattle, particularly calves and feeders. Handling mainly commercial grade cattle, these weekly auctions have influenced the price received by the farmer. Buyers have been coming in from Quebec and Prince Edward Island to buy calves and cattle at the sales, with the result that prices are estimated by provincial livestock fieldmen to be up to 10 cents higher than they would be without this extra competition for livestock.

Low cost calf production is a limiting factor for additional beef production. Calves were previously obtained from the dairy sector either as dairy steers or as dairy-beef crosses. This supply is now limited due to the declining dairy herd and feedlot operators who are having a problem to obtain calves for beef finishing. Beef cow enterprises are generally high cost operations, compared to other areas of Canada and other investment alternatives and as yet there has not been the profit incentive and technology available to permit the establishment of specialized cow-calf beef operations in the Atlantic region. Until such technology is available, an adequate supply of beef type calves will be a serious limiting factor for increased beef production in the region.

For the River Basin area, producer attitude toward beef production is an important factor to recognize. This is tied closely to the historical production patterns of the area, particularly the northern counties where potatoes have been the big cash crop, both in acres and dollars. Not only are farmers conditioned to the production and marketing of this crop but in the long run the comparative advantage of this crop over beef is sufficient for most growers to view the latter only as a secondary source of income subject to serious review only when potato prices are below average.

An expanding market for beef in New Brunswick will continue as the population and income per capita increase. It is estimated that the present annual deficit of 3.4 million pounds will rise to at least 3.6 million by 1981. Present production would only service about 25 percent of this need. Production increases will only result if present relatively high costs and producer attitudes are changed. This could occur if:

[6] Atlantic Regional Office, Statistics Canada, Truro, N.S.

1. low cost feed sources are developed;

2. returns to labor and capital for feeding cattle become high enough to compete with the present alternative use of resources;

3. beef calf production becomes economically feasible; and

4. production unit size is increased to obtain economies of size.

For beef finishing operations, prospects are somewhat mixed. Waste from potato processing may stimulate additional feeding if this material can provide a low cost source of feed for fed cattle. However, if the dairy herd continues to fall at a faster rate than the beef breeding herd increases, as has happened in the past, the source of feeder cattle in New Brunswick will continue to fall off. The continued sale of calves to feeders outside the province will also make feeders in short supply.

POULTRY MEAT AND EGGS

The net egg production of New Brunswick in 1972 was 9.9 million dozen (Table 10) with a value of $4.5 million. In the same year, 15.9 million pounds of poultry meat (Table 11) were produced in the province; the sale value of these products was $5 million. Egg and poultry meat production is the fourth largest contributor to the gross farm value of agriculture in the St. John River Basin; about 10 percent of the farm output comes from this source. Compared to the rest of the province the Basin produced about 49 percent of the poultry meat and 70 percent of the eggs sold by New Brunswick farms in 1971.

TABLE 10. EGG PRODUCTION, SALES AND FARM VALUE, NEW BRUNSWICK, 1961 TO 1972

Year	Average Number of Layers	Net Production	Sales	Value of Sales
	'000	'000 doz.	'000 doz.	$ '000
1972	542	9,932	9,702	4,545
1971	480	9,590	9,429	4,054
1970	489	8,409	8,206	3,831
1969	543	8,564	8,277	4,245
1968	535	8,570	8,249	3,983
1967	505	7,826	7,483	3,409
1966	539	8,588	8,207	4,199
1965	577	9,406	8,708	3,901
1964	596	9,869	9,073	3,834
1963	589	9,468	8,575	4,021
1962	578	9,287	8,191	3,575
1961	545	8,388	7,236	3,218

Source: Statistics Canada, Atlantic Regional Office, Truro, N.S.

The poultry industry in New Brunswick has been polarized into two distinct production sectors, one for eggs and the other for poultry meat, chiefly broilers. Production occurs on large commercial units, highly mechanized, having good labor and capital efficiency. Typical units in these enterprises are running 25 to 30,000 broilers per man and 10 to 15,000 laying hens per man. Production costs on these units are comparable with other producers in the Atlantic Region and New Brunswick poultry farmers can compete favorably with outside sources. Producers must rely on feed from

TABLE 11. PRODUCTION OF POULTRY MEAT, NEW BRUNSWICK, 1961 TO 1972

Year	Fowl and Chicken Meat	Farm Value	Turkey	Geese	Duck	Total Farm Value All Poultry Meat
	'000 lbs.	$'000	–	'000 lbs.	–	$'000
1972	15,900	4,790	681	16	7	5,011
1971	14,439	4,088	530	8	3	4,250
1970	15,010	4,155	757	3	4	4,387
1969	13,586	3,770	436	–	4	3,907
1968	11,262	3,150	883	9	4	3,410
1967	10,161	2,782	1,909	17	9	3,374
1966	9,593	2,711	1,797	18	14	3,272
1965	7,501	2,142	1,062	18	13	2,480
1964	5,436	1,566	419	18	13	1,718
1963	5,347	1,622	387	20	13	1,775
1962	4,802	1,444	398	29	13	1,591
1961	5,517	1,632	602	29	14	1,847

Source: Statistics Canada, Atlantic Regional Office, Truro, N.S.

Western Canada, making feed grain pricing and transportation policies a major concern of the industry.

The New Brunswick poultry producers have marketing boards established for both eggs and broiler chickens. These boards have jurisdiction over intra-provincial trade in these commodities, authority to set production quotas, prices for each product and generally to promote the sales of broilers and eggs. New Brunswick is currently co-operating with the other provinces in the national marketing agency for eggs authorized under Bill C176.

In 1971 New Brunswick produced approximately 63 percent of its egg requirements and 72 percent of its poultry needs (Table 4). This indicates that there is a deficit balance for both of these products - about 4.674 million dozen eggs and 5.486 million pounds of chicken and fowl. Turkey meat from New Brunswick producers was in short supply; only 13 percent of requirements was produced locally, leaving a deficit of about 3.404 million pounds. Thus, on the basis of becoming a self-sufficient area the province has a potential for increased production.

The prospects for increased poultry production may look optimistic from the standpoint of both meeting present needs in New Brunswick and for an expected increase in per capita consumption in the future. However, despite relatively high egg prices, present production trends would indicate that producers have not been responding to this deficit market situation. Total egg production has been relatively stable over the past 10 years, while turkey meat production has fluctuated at 10 to 50 percent of requirements during the same period. Both of these products are sensitive to price changes and apparently returns have been insufficient to bring forth local production. Egg production is not expected to increase substantially in the future, since supply will become more regulated through the provincial and federal egg marketing agencies. New Brunswick's share of the negotiated Canadian production quota stands at eight million dozen. The production of fowl and chicken meat has shown a steadily rising production trend since the early sixties, mainly due to increased output of broiler chickens. This trend will probably continue but at a slower rate due to the production controls sought by the growers through the broiler growers marketing board.

HOGS

Hog marketings contribute about 6 percent of the New Brunswick gross farm income. Hog sales in 1972 were about $4.5 million; approximately 60 percent of this production comes from the St. John River Basin (Table 12).

TABLE 12. COMMERCIAL HOG MARKETINGS, FARM RECEIPTS AND YEARLY AVERAGE HOG PRICES, NEW BRUNSWICK, 1961 TO 1971

Year	Farm Cash Receipts	Commercial Marketings	Yearly[1] Average Farm Price
	$'000	No.	$/cwt.
1972	4,477	61,650	37.16
1971	3,929	71,456	26.52
1970	4,177	65,326	33.30
1969	4,068	63,198	35.37
1968	3,524	62,953	30.06
1967	2,733	44,916	30.24
1966	3,088	32,836	35.65
1965	2,902	32,647	33.15
1964	2,728	38,722	27.44
1963	2,798	36,895	27.85
1962	2,833	37,469	29.36
1961	3,061	44,340	28.38

[1] 1961-68 – Maritimes Grade "A".
Jan. 1969 – Oct. 1969 – Maritime Base Price.
Nov. 1969 – New Brunswick Auction Base Price.

Source: Statistics Canada, Regional Office, Truro, N.S.

The market for pork in New Brunswick is a local one to packers located in Moncton, St. John, Fredericton, Campbellton and Edmundston. Hogs are sold via teletype auction through a Hog Marketing Board which has been operating since November 1969. Prices determined in New Brunswick are essentially based on the North American hog market. Since the province produces less than 1 percent of the total Canadian production and 31 percent of local needs, sales in the province have no influence on the price to its producers. Prices tend to follow the pattern prevalent at Toronto and are usually very close to those actual levels. Thus, producers are subject to the usual hog price cycles typical in North America and a January and July high seasonal price.

In the period from 1965 to 1970 hog prices have averaged over 30 cents per pound on an annual basis (Table 12). The year 1971 saw the lowest hog prices to growers since 1960, due to the oversupply of pork on the North American market. Prices in late 1971 were rising and prices in 1972 were well above the average price of the decade. While costs of production on many Maritime hog units are also rising, producers are now in a more favorable marketing period.

The deficit position of New Brunswick and of the entire Atlantic region allows for increased production in the

province's hog industry. Producers there have a quality advantage over other areas of Canada; however, one serious drawback to increased production in the region is high feed costs and dependence on feed from Western Canada, moved to the area under the Feed Freight Assistance Act. While costs are high and prices for pork are subject to wide fluctuations, the average price received is high enough to stimulate additional production as evidenced by the increased sales over the past few years (Table 12). This trend is expected to continue along with the concentration of production on larger production units, due to the economies of size to be realized. The dependence on outside feed sources will continue to be the basis for the New Brunswick hog industry.

APPLES

The acreage of apple orchards in New Brunswick was estimated at 3,300 acres for 1971. Of this about 3,175 acres were located in the St. John River Basin. The area producing apples is declining as the older orchards are not being replaced as quickly as they are removed from production. Production in recent years has been between 450,000 and 530,000 bushels (Table 13). In 1972 the total crop was 325,000 bushels or a yield of just over 100 bushels per acre, well below the average yield of the major apple producing areas of Canada.

TABLE 13. APPLE PRODUCTION AND VALUE, NEW BRUNSWICK, 1959 TO 1972

	Production	Average Farm Value	Total Farm Value
	'000 bu.	$ per bu.	$'000
1959	500	1.10	550
1960	400	1.20	480
1961	525	1.15	604
1962	500	1.20	600
1963	475	1.23	584
1964	425	1.25	531
1965	450	1.23	554
1966	450	1.25	562
1967	500	1.28	640
1968	435	1.65	718
1969	530	1.17	620
1970	330	.90	297
1971	435	1.05	457
1972	325	2.20	715

Source: Statistics Canada, Regional Office, Truro, N.S.

The major market for New Brunswick apples is an internal one. The local dessert market is served through local farmers' markets, roadside stands and direct sales to wholesale and retail outlets. Sales to destinations outside the province were as high as 125,310 bushels in 1968-69 (28.8 percent of the crop). These sales are primarily due to the lack of adequate storage facilities which force crop disposal by the end of March. These sales of New Brunswick apples are to Newfoundland, Nova Scotia (mainly for processing), Prince Edward Island, Great Britain, and the U.S.A. Newfoundland provides the largest outlet, usually 40,000 to 50,000 bushels annually, or about 80 percent of total shipments out of the province. For the remainder of the crop year New Brunswick is a net importer of dessert apples from Nova Scotia, Quebec, British Columbia, New Zealand, South Africa and the U.S.A.

There are no apple processing facilities in New Brunswick; however, about 13 percent of the province's production of apples is processed in Nova Scotia or the U.S.A. Due to the low volume of apples moved to processing it is not economically feasible to establish facilities in New Brunswick. As a result, all of the processed apple products consumed in the province must be brought in.

Prices received by apple growers have averaged between 3 and 4 cents per pound for the past ten years. Farm value for the crop is usually about $500,000 per year with a high of $718,000 in 1968 due to a higher than average price ($1.65 per bushel) for processing apples in that crop year. Higher prices in 1972 ($2.20 per bushel average) also pushed farm value of the crop over $700,000 despite a decline in production to 325,000 bushels.

There is a potential market for New Brunswick apples, both for domestic markets and export outlets. Estimates of present fresh product requirements indicate that there is an annual deficit of about 125,000 bushels even if all of the present production were marketed in the province. Exports of about 100,000 bushels means that the potential home market is approximately 225,000 bushels per year. At a yield of 300 bushels per acre this means an additional 750 acres of apple production is required to meet present market opportunities. Another 25,000 bushels annually will be required by 1981 just to meet increased population needs. Assuming no change in export markets, there will be an opportunity to provide about 250,000 bushels in addition to present production.

STRAWBERRIES

Acreage and average yield data for strawberries are unavailable for New Brunswick, but unofficial estimates for the 1971 crop indicate that about 600 acres of the

crop were grown with approximately 450 acres of berries in the St. John River Basin. The provincial yield per acre has been estimated by provincial agricultural specialists at 4,500 quarts. Total acreage has remained relatively stable in recent years, but production varies drastically from year to year due to weather conditions. For example, the provincial crop was only 800,000 quarts in 1970 but favorable conditions in 1967 and 1968 permitted record crops of 2.3 million quarts annually. The 1972 production was down to 769,000 quarts, the lowest production in recent years (Table 14).

With prices averaging in the vicinity of 30 cents per pound (Table 14) the farm value of the crop has been about $500,000 with a recent range of $288,000 (1970) to $641,000 (1968). The 1972 farm value of the crop was $323,000.

TABLE 14. STRAWBERRY PRODUCTION AND VALUE, NEW BRUNSWICK, 1957 TO 1972

	Total Production	Average Price per Qt.	Total Farm Value
	'000 qts.	$	$ '000
1957	700	.23	161
1958	1,000	.22	220
1959	600	.28	168
1960	1,500	.25	375
1961	1,400	.26	364
1962	1,000	.26	260
1963	1,500	.25	375
1964	2,000	.27	540
1965	1,300	.28	364
1966	1,300	.31	403
1967	1,300	.24	552
1968	2,290	.28	641
1969	1,705	.33	563
1970	800	.36	288
1971	1,734	.36	624
1972	769	.42	323

Source: Statistics Canada, Atlantic Regional Office, Truro, N.S.

Present markets for New Brunswick strawberries are the local fresh market, processing and exports. The estimated provincial requirement (Table 4) for fresh berries was 1,269,000 quarts in 1971. These are sold directly to wholesalers and retailers, through farm sales to consumers (roadside stands, etc.) and by means of "pick-your-own" operations. Exports to the Northeastern United States have increased in the last few years; depending on the annual production, these sales have been 150,000 to 400,000 quarts yearly. While some assembly and transport difficulties have been encountered, the prices received in this market have been sufficient to provide good returns to growers shipping to these markets. These alternative sales also have kept local prices steadier and higher.

Excepting low yields in some years due to many causes attributed to weather, New Brunswick produces sufficient strawberries to meet its present fresh market requirements. At present production levels this will still be the case in 1981. Potential for increased sales of the crop lie in the export and processing outlets. Both markets are very promising and make strawberries one of the real possibilities for increased agricultural production in the province.

Recent investigations by the New Brunswick Department of Agriculture personnel indicate that there are good markets for fresh strawberries in Boston, New York, Philadelphia, Chicago, Baltimore and Washington, D.C. during the normal New Brunswick harvesting period. The estimated potential for this market is about 750,000 quarts with normal prices high enough to overcome packaging and transportation costs and still provide a competitive net return to growers.

Processing provides an additional potential market for New Brunswick strawberries. Contracts for processing are available at about 20 cents per pound (25 cents per quart). This price is well below the local or export fresh market price; however, costs of production of this type of berry are lower than for fresh strawberries. Growers feel that at this price production per acre would have to be about 6,000 quarts per acre to break even. Yields of 10,000 quarts and over are not impossible in the province and growers are rapidly adopting the new varieties and production technology necessary to get this type of yield.

BLUEBERRIES

New Brunswick blueberry production is currently running at about 4 to 5 million pounds per year (Table 15) with wide yearly variations due to weather conditions. The peak years were 1966 and 1967 when production was 7 million pounds. The lowest year in recent years was 1970 with 1.5 million pounds. Most of the crop (about two-thirds) is sold for processing in the eastern U.S. markets.

Most of the blueberry production in the province takes place in Charlotte, Kings and Albert Counties. In the older picking areas yields per acre have been declining; however, recently new areas have been opened up to offset this decrease. Thus, production potential remains fairly constant, hampered only by late spring frosts which result in poor fruit set.

TABLE 15. BLUEBERRY PRODUCTION AND VALUE, NEW BRUNSWICK, 1957 TO 1972

	Total Production	Average Price per lb.	Total Value
	'000 lbs.	$	$'000
1957	3,300	.13	429
1958	2,500	.13	325
1959	3,500	.11	385
1960	3,500	.14	490
1961	4,500	.09	405
1962	4,000	.09	360
1963	4,000	.11	440
1964	3,000	.14	420
1965	2,500	.25	625
1966	7,000	.16	1,120
1967	7,000	.09	630
1968	1,500	.15	225
1969	5,500	.15	825
1970	1,500	.22	330
1971	4,800	.15	720
1972	3,779	.24	906

Source: Statistics Canada, Atlantic Regional Office, Truro, N.S.

The total crop value of blueberries fluctuates considerably due to the yield variations and the wide swings in price received each year - from 9 to 25 cents per pound in the past 15 years. Prices for the New Brunswick crop are established by the eastern U.S. market and are thus a reflection of external supply and demand factors. Crop value has ranged from $225,000 (1968) to $1,120,000 (1966). In 1972 the value of the New Brunswick blueberry crop was $906,000.

Since most of the crop is sold outside the province, expansion in the output of blueberries depends on the price incentive offered by the export market. In recent years prices have been high enough to warrant expansion in the acreage and yield of the New Brunswick crop and growers have been responding by bringing additional land into production and improving management practices to increase yield per acre.

VEGETABLES

Soil, climatic conditions and other production factors in parts of New Brunswick, particularly the St. John River Basin, are suitable for the production of several vegetable crops. These include cabbage, beets, carrots, peas, beans, celery, corn, lettuce, cucumbers, onions, tomatoes, broccoli, brussell sprouts, cauliflower and squash. All of these crops can be sold on a local fresh market or to processors. Both of these markets offer considerable potential in terms of meeting present requirements. The deficit varies considerably by product; however, most crops fall far short of supplying market needs. A few of these vegetable crops will be discussed briefly to indicate present production and marketing trends.

During the past five years, from 20 to 60 acres of beets have been grown in New Brunswick (Table 16); this represents a decline of about one-third from the production of the late 1950's. Yields have fluctuated from 6,600 to 1,100 pounds per acre and total production generally is in the vicinity of 600 to 700 thousand pounds per year which is approximately the fresh crop requirement. Total farm value of the crop in 1972 was $21,000.

Less than 200 acres of cabbage are grown in New Brunswick; the 1971 area was 210 acres (Table 16). Yields generally run at least 15,000 pounds per acre with total production in the vicinity of 2.5 to 3.5 million pounds; the 1972 production was 2.6 million pounds. Farm price for cabbage has been increasing slightly over the past 15 years; in 1972 the average price was 5.6

TABLE 16. AREA, YIELD, PRODUCTION AND VALUE OF SELECTED VEGETABLE CROPS, NEW BRUNSWICK, 1972

Vegetable Crop	Acreage	Yield per Acre	Total Production	Average Farm Value	Total Farm Value
	Acres	'000 lbs.	'000 lbs.	$ per lb.	$'000
Beets	20	11.4	228	.090	21
Cabbage	170	15.0	2,550	.056	143
Carrots	200	26.5	5,300	.062	329
Cauliflower	30	8.4	252	.065	16
Corn	350	4.2	1,470	.072	106
Field Cucumbers	60	8.2	492	.070	34
Field Lettuce	30	9.7	291	.155	45
Field Tomatoes	110	10.2	1,122	.125	140

Source: Statistics Canada, Atlantic Regional Office, Truro, N.S.

cents per pound for a total farm value of $143,000. New Brunswick produces just over 50 percent of its fresh cabbage requirements.

Carrot acreage has fluctuated during the past 15 years but by the early 1970's the crop had levelled off at about 200 acres. The 1972 production of 5.3 million pounds came from 200 acres (Table 16). Prices have also been favorable in late years with the 1972 price at 6.2 cents per pound on average. The total value of the carrot crop was $329,000 in that year. New Brunswick produces about 80 percent of its fresh carrot requirements. Processing markets are not presently satisfied and there is an increasing need for carrots in the province.

Cauliflower production contributes $15,000 to $20,000 to New Brunswick farm production. Most of this crop goes to an expanding processing market with seasonal fresh needs adequately supplied by provincial growers. The 1972 crop was 252,000 pounds from 30 acres.

Sweet corn production in the province amounts to almost 1.5 million pounds, which is sufficient to meet the fresh product requirements. In 1972 this output was produced on 350 acres with a yield of about 4,200 pounds per acre (Table 16). Prices have been increasing recently and in 1972 reached 7.2 cents per pound. Total value of the crop was $106,000 that year. The processing market offers considerable potential for this crop; there is also an opportunity to exploit markets in Newfoundland and the Northeastern States.

The acreage of field cucumbers has varied considerably and in recent years it has remained at just less than 100 acres. The 1972 production was from 60 acres and amounted to 0.5 million pounds (Table 16). Total farm value of this crop was $34,000 from a price averaging 7 cents a pound. High labor costs, particularly for harvesting, have been a deterrent to increased production, and the market potential for this crop is in the processing sector.

About one-third of the field lettuce requirements are met by provincial production; in 1972 output was about 291,000 pounds from 30 acres (Table 16). Prices have been slowly increasing since 1965, with the average farm price in 1972 at 15.5 cents; the total farm value of the crop was $45,000.

The acreage and production of field tomatoes is presently sufficient to meet fresh seasonal requirements, with a small share (15 percent) of the output going to the processing market. Acreage of the crop has been declining in recent years and was 110 acres in 1972. The average farm price in that year was 12.5 cents per pound, providing a total farm value of $140,000 (Table 16).

Approximately 4,700 acres of peas, beans, and cole crops are grown in New Brunswick for the processing industry. These crops are produced by the processors or by farmers under contract to the plants. Markets for these crops in the processed form are expanding due to the increased requirements by consumers for frozen and prepared food products. The St. John River Basin is well suited for the production of these crops and it is anticipated that acreage will expand as the processed product markets are developed.

MARKETING BOARDS AND PRICING IN CANADA

The growth rate of Canada's more than 80 agricultural marketing boards, which market a large percentage of many products, has increased significantly since the 1960's.

Marketing boards function under the authority of government legislation. They may adopt several different procedures as part of their marketing plan. This article reviews and classifies the procedures used.

*G.A. Hiscocks and T.A. Bennett**

INTRODUCTION

There is an increasing concern in various segments of today's society regarding the mechanisms and practices of price determination in agriculture. This paper examines one of the organizational and institutional approaches to price determination that has been adopted in Canada -- marketing boards. Marketing boards have grown extensively in Canada beginning as far back as 1929, and have developed steadily until the 1960's. In the last decade, growth has been much more rapid,[1] culminating in national marketing board legislation in 1972.[2] More national and provincial developments can soon be expected.

BACKGROUND

Agriculture is a shared responsibility between the ten Provincial Governments and the Federal Government under the British North America Act, 1967. All the provinces have some form of legislation which sets up a provincial marketing board or council. In addition, the Federal Government established a National Farm Products Marketing Council in 1972.

The provincial boards or councils have the authority to establish (or to recommend to ministers to establish) commodity marketing boards within the province, or country, with particular powers, each having a specific marketing plan. Once a commodity board is in operation, the role of the provincial board (or council) is to supervise the commodity board. The diverse nature of both Canadian agriculture and politics has resulted in a wide divergence of powers given to commodity boards and differing approaches to their supervision. Hence, it becomes almost impossible to summarize, on a nationwide basis, the current philosophical approach to boards and their operation.

There are more than 80 marketing boards functioning in Canada[3]. The specific nature, organization, and procedures of each are related to its principal commodity and associated problems, the relevant provincial or national legislation under which it is organized, the relative position of the commodity in Canadian and

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[1] *Marketing Boards in Canada: National Summary.* Economics Branch, Agriculture Canada, first issue 1957, latest 1970.

[2] *Farm Products Marketing Agencies Act, 1972.* This Act enables national marketing boards to be established. Earlier federal legislation had only facilitated the operation of provincial commodity boards - Agricultural Products Marketing Act, 1949, amended 1957.

[3] This number includes only agricultural boards and commissions, and omits pulpwood and oyster boards and the Quebec manufacturing milk boards.

TABLE 1. COMMODITY GROUPS AND NUMBER OF PROVINCIAL BOARDS

COMMODITY GROUP	NO. OF BOARDS	COMMENT
Grains	6	Excluding Canadian Wheat Board
Sheep, Wool, Cattle	4	Excluding Canadian Sheep Council
Hogs	7	
Dairy	15	Including Provincial Milk Commissions but excluding Canadian Dairy Commission
Eggs	11	Excluding National Egg Marketing Agency
Broilers	8	
Turkeys	5	
Fruit	11	
Vegetables	16	
Tobacco and Honey	6	

world agriculture, and other factors. Thus, both the theory behind the desire to establish boards and their actual evolution becomes relevant[4].

The first step in examining marketing boards is to clarify the definition, objectives and powers of marketing boards (or marketing commissions)[5]. "A marketing board can be defined as a compulsory, horizontal marketing organization for primary and processed natural products operating under authority delegated by the government. The compulsory feature means that all farms producing a given product in a specified region are compelled by law to adhere to the regulations of a marketing plan. The horizontal aspect means that marketing boards have influence over the output of all farms participating in the particular marketing scheme, and that they aggregate the supply from all the farms up to a chosen or permitted level. Government authority through legislation is essential to achieve the required compulsion. The power of the boards utilizing this authority is generally wide enough to affect the form, time and place of marketing and, directly or indirectly, the price. It is clear that this is a powerful and far-reaching type of market organization and that society takes a very significant step when it gives such powers to any group in the economy."[6]

The major objectives of this powerful institution are:

(1) to maintain or increase the incomes of the producers of the particular product;

(2) to stabilize income from the sales of the product; and

(3) to standardize the terms of sale of the product.[7]

The last objective has also been stated in a wider context - "to equalize market opportunities or market returns as between different producers."[8]

To clearly identify the powers of, and the procedures used by, marketing boards is a difficult task because of the many boards and the wide range of variation in powers and procedures. To identify these powers and procedures a comprehensive analysis was made of all the boards operating under provincial jurisdiction in Canada.[9] A major criterion determining the type of procedures utilized by each board was found to be the nature of the commodity itself. Thus, the initial step was to place all boards into one of ten commodity groups. With a few arbitrary classifications, the commodity groups and the number of provincial boards in each group are listed in Table 1.

At first glance this list would appear to encompass most of Canadian agriculture. However, the largest concentrations are in poultry (including eggs, broilers and turkeys) and dairy, with dairy marketing boards in every province with any significant production. There are hog marketing boards in most of the major hog-producing

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[4] G.A. Hiscocks, *Market Regulation in Canada,* Canadian Farm Economics, Volume 7, No. 2, June, 1972.

[5] G.A. Hiscocks, *Market Regulation in Canada.* Marketing Boards almost always have a board of directors elected from producers of the product. The title "Marketing Commission" is confined to those boards where the board of directors is appointed by the controlling Council or Government and sometimes includes representatives from other parts of the marketing system.

[6] G.A. Hiscocks, Market Regulations in Canada, pages 20-21

[7] G.A. Hiscocks, Market Regulations in Canada, page 21.

[8] Michele M. Veeman, *Alternative Techniques of Quota Regulation by Marketing Board Actions,* published in *Market Regulation in Canadian Agriculture,* Occasional Series No. 3, University of Manitoba, May, 1972.

[9] There are four agricultural marketing boards operating under federal jurisdiction. Three of these, the Canadian Wheat Board, Canadian Dairy Commission and the Canadian Egg Marketing Agency are analyzed separately. The fourth, the Canadian Turkey Marketing Agency was established after this paper was prepared.

provinces, but for other livestock, there are very few marketing boards. In grains, the Canadian Wheat Board is responsible for sales of prairie wheat, oats, and barley, and for the movement, but not the sales, of rapeseed, flaxseed and rye. Provincial grain marketing boards are confined to Ontario and to intra-provincial trading within Manitoba and Alberta. The rest of the boards cover a wide collection of commodities, mainly fruits and vegetables.

Within each of the ten commodity group classifications, the specific powers and procedures were identified to indicate the extent of each board's control. The powers and procedures were then grouped under 14 headings, each having some effect on price (see Table 2). The categories of the powers or procedures of marketing boards are as follows:

1. **Pooling**: A board may pool all the proceeds from sales so that each producer receives the same average price after adjustments for such items as grade.

2. **Consumer or Wholesale Price**: A board may have the power to set wholesale or consumer prices or both.

3. **Producer Prices**: A board may have the power to set minimum and/or maximum or fixed producer prices.

4. **Price Determination**: A board may use one of the following means of setting a price: (a) formula; (b) negotiation; or (c) price fixing.

5. **Quotas**: A board may have the power to set marketing and/or production quotas for every producer.

6. **Licensing**: A board may have the power to require licensing of growers, producers, processors or dealers, or any other person involved in any way with the marketing process.

7. **Seizure and Disposal**: A board may have the power to seize and dispose of any product marketed contrary to board orders.

8. **Regulate Interprovincial and Export Trade**: A board may have the power (delegated by the federal government) to regulate interprovincial and export trade.

9. **Import Control**: A board may have indirect control over imports by prescribing the type of package to be used.

10. **Purchase and/or Sell**: A board may have the power to purchase and/or sell the regulated product.

11. **Market Information**: A board may supply market information to producers and other interested persons.

12. **Market Development – Domestic**: A board may develop new domestic markets.

13. **Market Development – Export**: A board may develop new export markets.

14. **Promotion**: A board may undertake promotion of the regulated product.

PRICE DETERMINATION

Price determination of farm products has many related problems[10]. The agricultural economic literature abounds in articles, bulletins, texts and reviews on this subject. A somewhat oversimplified statement of the problem is that the market mechanism for farm products is, in some respects, inefficient. One basic difficulty is that for most agricultural commodities there are many sellers but only a few buyers. In addition, there is frequently insufficient knowledge on the part of individual farmers and of groups of sellers of the relevant demand and supply situation. These conditions exist both at specific times of decision-making in the short-run regarding sales by farmers and in the longer-run decisions of production alternatives and the production mix. These problems have been among the prime reasons for the search for different marketing procedures and for marketing boards to have acquired such a large role in marketing in Canada.

Once a marketing board is created, it constitutes a new institution in the marketing system and, as a result, several types of prices may be established. Often, rather than a single market price, there may be both a producer and a market price established. Further, as a board seeks to obtain the maximum revenue possible, two-price systems or even three-price systems often develop such that sales to a primary market are at a higher price than to a secondary or tertiary market.

Price determination in the Canadian context, as in agriculture elsewhere, is complex. The various sub-sectors of Canadian agriculture are either developed or organized on a provincial basis, making the question of price determination one of local or provincial prices. However, the regional and national price situation

[10] See for example, F.L. Thomson and R.J. Foote, *Agriculture Prices*, McGraw-Hill Book Company, Inc. 2nd ed., 1952.

TABLE 2. POWERS AND PROCEDURES OF PROVINCIAL MARKETING BOARDS 1973

	Pooling	Establish Consumer & Wholesale Price	Establish Producer Price	Type of Pricing	Quotas	Licensing	Seizure & Disposal	Control of Interprovincial & Export Trade	Import Control	Purchase & Sell	Market Information	Market Development Domestic	Market Development Export	Promotion
1. Grains														
Alberta to Grain Commission											X			X
Manitoba Feed Grain Mk. Comm.	X		Min.	Fx.		X				X				X
Ontario Seed Corn Growers M.B.			Min.	N		X								
Ontario Wheat Producers M.B.			Min.	N		X		X		X				
Ontario White Bean Prod. M.B.	X		Min.	Fx.		X		X		X				X
Ontário Soybean Producers M.B.			Min.	Fx.		X								
2. Sheep, Wool & Cattle														
Alberta Sheep & Wool Comm.						X								X
Alberta Cattle Comm.						X						X		X
Saskatchewan Sheep & Wool Mk. Comm.												X		X
Nova Scotia Wool Mk. Bd.			Fx.	Fx.		X	X	X						
3. Hogs														
Alberta Hog Mk. Bd.			Tele-Type			X							X	X
Saskatchewan Hog Mk. Comm.			M & M	N		X							X	X
Manitoba Hog Producer Mk. Bd.			Tele-Type		M	X							X	X
Ontario Pork Producers Mk. Bd.			Tele-Type			X		X						
New Brunswick Hog Mk. Bd.			M & M	Fx.	M			X						X
Nova Scotia Hog Mk. Bd.			Min.	Fx.		X		X						
Prince Edward Island Hog Comm.			Fx.	Fx.		X								
4. Dairy														
British Columbia Milk Bd.			Min.	F	M	X								
Alberta Dairy Control Bd.		C+W	Min.	N	M	X								
Milk Control Bd. of Saskatchewan		C(Min+Max)	Min.	N	M	X								
Milk Control Bd. of Manitoba		C(Max)	Min.	N	M	X								
Ontario Milk Marketing Board			Min.	F+N	M	X		X						
Federation of Ind. Milk Producers-Quebec			Min.	N	P+M			X						
Carnation Milk Prod. Bd.			Min	N	P+M									
Creamerie Revelation Bd.			Min	N	P+M									
Federation of Quebec Milk Pr.			Min	N	P	X								
New Brunswick Dairy Prod. Comm.		C+W	Min	F	M									
New Brunswick Cream Pr. M.B.			Fx	Fx	M									
New Brunswick Cheese M.B.			Fx	Fx	M	X	X							
Nova Scotia Dairy Commission			Fx	Fx		X								
Prince Edward Island Milk Control Bd.		C+W	Fx	Fx		X								
5. Eggs														
British Columbia Egg Mk. Bd.	X	W	Min	Fx	M	X		X						X
Alberta Egg & Fowl Mk. Bd.		W	Min	Fx	M	X								X
Saskatchewan Comm. Egg Pr. Mk. Bd.		W	Min	N	M	X	X	X						
Manitoba Egg Producers' Mk. Bd.	X		Min	Fx	M	X				X				X
Ontario Egg & Fowl Prod. Mk. Bd.			Fx	Fx	M	X		X		X				
Federation of Prod. of Eggs, Quebec			Min	N	M	X		X						
New Brunswick Egg Mk. Bd.			M+M	N	M	X	X							X

6. Broilers													
British Columbia Broiler Mk. Bd.	X		M+M	N	M	X	X	X	X				X
Alberta Broiler Grower's Mk. Bd.			Min	N	M	X	X	X					
Saskatchewan Broiler Chick Pr. Mk. Bd.			M+M	N	M	X		X					
Manitoba Broiler Chick Pr. Mk. Bd.			M+M	N	M	X				X			X
Ontario Broiler Chick Pr. Mk. Bd.			Min	Fx	M	X		X		X			X
Federation of Quebec Poultry Producers			Min	N	P+M	X							
New Brunswick Broiler Gr. Mk. Bd.			M+M	N	M	X							X
Nova Scotia Chicken Mk. Bd.			Min	N	M	X		X					X
7. Turkeys													
British Columbia Turkey Mk. Bd.	X		Min	Fx	M	X	X	X	X				X
Alberta Turkey Growers Mk. Bd.			Min	N	M	X		X					
Saskatchewan Turkey Mk. Bd.			M+M	N	M	X	X	X		X			
Manitoba Turkey Prod. Mk. Bd.			M+M	Fx	M	X				X			X
Ontario Turkey Prod. Mk. Bd.			Min	N	M	X		X					X
8. Fruit													
British Columbia Fruit Bd.	X		M+M	Fx		X	X	X					X
British Columbia Cranberry Mk. Bd.	X				M	X	X						X
British Columbia Grape Mk. Bd.			Min	Fx									X
Ontario Apple Producers' Mk. Bd.			Min	Fx		X							
Ontario Berry Grow. for Processing Bd.			Min	N		X		X					
Ontario Fresh Fruit Growers' Mk. Bd.			Min	Fx		X		X					
Ontario Fresh Grape Grow. Mk. Bd.			Min	Fx		X		X					
Ontario Grape Growers' Mk. Bd.	X		Min	N		X		X					
Ontario Tender Fruit Mk. Bd.	X		Min	Fx	M	X		X					X
Saguenay—Lake St. John Blueberry Prod. Mk. Bd.			Min	N	P+M								
New Brunswick Apple Mk. Bd.			M+M	N	M	X	X						
9. Vegetables													
British Columbia Coast Veg. Mk. Bd.	X	W.C.	M+M	Fx	M	X	X	X					X
British Columbia Interior Veg. Mk. Bd.	X	W.C.	M+M	Fx	M	X	X	X					X
British Columbia Mushroom Mk. Bd.	X		Min	Fx	M	X							X
Alberta Fresh Veg. Comm.						X							X
Alberta Potato Comm.						X		X					X
Alberta Veg. Growers' Mk. Bd.			Min	Fx		X							
Manitoba Veg. Prod. Mk. Bd.	X		M+M	N	M	X				X			X
Manitoba Root Crop Prod. Mk. Bd.	X				M	X				X			
Ontario Asparagus Grow. Mk. Bd.	X		Min	N	M	X		X		X			
Ontario Greenhouse Veg. Prod. Mk. Bd.			Min	Fx		X		X					
Ontario Onion Prod. Mk. Bd.					M	X		X					X
Ontario Veg. Growers' Mk. Bd.			Min	N		X							X
Quebec Tomato Grow. Mk. Bd.			Min	N								X	
Prince Edward Island Veg. Commodity Mk. Bd.	X		Min	Fx			X	X					X
Prince Edward Island Potato Mk. Bd.			Min	Fx		X		X			X		X
Ontario Winter Celery Grow Mk. Bd.			Min	N		X							
10. Tobacco & Honey													
Ontario Flue-Cured Tobacco Gr. Mk. Bd.	X		Min	P.M.	X	X	X						
Quebec Cigar & Pipe Tob. Gr. Mk. Bd.			Min	P.M.	X								
Quebec Flue-Cured Tob. Grow. Mk. Bd.			Min	P.M.			X						
Saskatchewan Honey Prod. Mk. Bd.	X		Min		X	X							
Manitoba Honey Mk. Bd.			M+M		X	X							

Key to Abbreviations Used

Maximum	Max.	Formula Pricing	F.
Minimum	Min.	Negotiation	N.
Fixed	Fx.	Marketing	M.
Consumer	C.	Productions	P.
Wholesale	W.	Minimum & Maximum	M+M

Source: Economics Branch, Agriculture Canada.

cannot be ignored when Canadian production and marketing is involved or when national marketing organizations exist. To handle this problem it is necessary to consider a basic national or regional price and its determination and then to consider separately the actual price received by individual producers or specified groups of producers and the determination of this price.

A collective analysis of all marketing boards leads to a basic generalization. There is a scale, in descending order, of the strength of their powers and influence on price. Heading the list are the fluid milk boards or commissions which directly fix prices and establish marketing quotas for a given milk-shed. Next, are the poultry product marketing boards which set marketing quotas and minimum sales prices. In a special class is the Ontario Flue-Cured Tobacco Marketing Board whose powers are considerable.

Another major group of boards negotiates price with the major buyers, which are often very few in number and are sometimes just one processing plant. The establishment of these boards has ensured that every producer receives the same basic price, that quality standards are fair and uniform, and that delivery arrangements are not arbitrary. However, the buyers generally determine volumes and, thus, if producers press for higher prices, buyers may take lower volumes. Those boards which cover more than one market outlet (i.e. fresh and processing and/or domestic and export) may have a greater opportunity to influence prices.

In the remaining commodities, the activities of marketing boards essentially amount to an organization of markets (e.g. hog board tele-type systems, Ontario Fresh Fruit Board, Alberta Feed Grain Commission) and the promotion of product and market development (e.g. Alberta Cattle Commission, Alberta Sheep and Wool Commission, and many fruit and vegetable boards).

Following these generalizations, an examination of a few examples of specific provincial boards and their pricing operations will illustrate the above general comments. The three national or Federal Marketing Boards -- The Canadian Dairy Commission, The National Egg Marketing Agency and The Canadian Wheat Board will also be briefly examined.

MILK MARKETING BOARDS OR COMMISSIONS

The actions and regulations of the milk boards determine the price to producers for all milk delivered to the fluid market (excess enters the manufacturing market at a lower price). This price is paid by wholesalers and directly affects the consumer price. In most recent years changes in these prices have been determined by supply and the factors affecting it, especially inflation in input costs. To the extent that fluid milk quotas can be bought and sold and that prices for quotas have been rising in the past decade, milk boards and commissions have had a fairly strong influence on price and margins.

In British Columbia, where almost all the milk produced in the province is consumed in the form of fluid milk, a pricing formula is used. The formula includes a number of demand variables, but largely depends on the farm costs of production. Buyers of fluid milk must pay the price calculated according to this formula. Thus, the British Columbia Milk Board directly determines the price for fluid milk in that province.

In Ontario, where a major part of the milk produced enters the industrial market, a dual system of pricing is used. All fluid milk is based on a pricing formula, but while producer costs of production are looked at closely, consumer considerations are also taken into account. For industrial milk, prices are determined with regard to federal support levels and prices in other provincial markets. These two sets of prices are pooled to producers. Buyers of milk for different uses in Ontario must pay the prices determined by the Ontario Milk Marketing Board, but outside influences, including federal support subsidies and the world market supply and demand, strongly affect these prices.

POULTRY PRODUCT MARKETING BOARDS

In every case Poultry Product Marketing Boards can set minimum sales prices for producers and establish marketing quotas[11]. Since their establishment over the last decade, (many very recently) they have raised prices by restricting sales through quotas. Poultry products, however, flow relatively freely in international trade, which puts distinct limits on the extent to which commodity boards can determine price. An added aspect is the high degree of vertical integration in the industry, making price determination for the product very difficult.

THE ONTARIO FLUE-CURED TOBACCO GROWERS MARKETING BOARD

The Ontario Flue-Cured Tobacco Growers Marketing Board has wide powers, including the ability to fix

[11] H.V. Walker, *Marketing Boards and Quota Policies for Canadian Farm Products: An Appraisal of Performance,* Farm Foundation, 1968.

minimum prices for the sale of its tobacco. It has established strong production quotas, a large auction market, grading and storage facilities and price negotiating activities. The board annually negotiates with processors and buyers a minimum price which it feels the producer must receive to cover his costs. A study of Canadian and American tobacco prices has shown that Canadian prices follow the trends of the United States' prices very closely.[12] Canadian prices seem, therefore, to be almost solely determined by the United States' market.

THE BRITISH COLUMBIA FRUIT BOARD

The British Columbia Fruit Board was one of the first marketing boards in Canada. A large quantity of tree fruits (apples, pears, cherries, peaches, plums, and apricots) is grown annually in the Okanagan and adjacent valleys of central British Columbia. The marketing of this fruit, other than that from roadside stands, is in the hands of a single-desk selling agency, British Columbia Tree Fruits. Rather than fixing prices, B.C. Tree Fruits prices the fruit at a level that will move it in the market. Fruit prices on the market cannot be forced because consumers can turn to another source of supply and buy at a lower price. Apples, which keep very well, can be held off the market to some degree until the market price has improved. With cherries, however, the marketing season is very short and the price must be established at the correct level at the beginning of the marketing period because it will change very little over the short season. If the price is set too high, the fruit will not sell and if too low, it will not offset production costs. Thus, while the Fruit Board and the selling agency has wide powers and extensive control over the packing, storage, processing and movement of the fruit, for the most part, fruit prices are set according to demand and the general fruit and food supply situation.

CANADIAN DAIRY COMMISSION

The Canadian Dairy Commission is a federal agency which implements the price and income support measures of the Federal Government for manufacturing milk in Canada. While it supports product prices through storage and disposes of commodities through the usual marketing channels and makes some direct export sales, it is not quite a marketing board in the sense used throughout this paper. In particular, the heavy involvement of government subsidy and trade restrictions put it in a different position from other boards. Nevertheless, it has a fairly strong impact on domestic prices.

NATIONAL EGG MARKETING AGENCY

The National Egg Marketing Agency is one of the newest national boards, the first under the recent federal legislation, and its operations are still in the developmental stage. The Board is essentially responsible for trade between provinces. A national production quota has been set at a level no higher than recent average domestic consumption and is shared among the provinces with a marketing quota given to every producer. The pricing technique is a weekly and annual price based on cost of production. A survey is under way to establish costs of production on a national standard basis. An attempt will be made to set a price within each province based on costs. If a province produces a surplus, the national board has an intervention policy and sets an intervention price to discourage dumping from one province to another. This new board will plan to set a price based on continually surveyed production costs.

CANADIAN WHEAT BOARD

The Canadian Wheat Board is a marketing board appointed by the Federal Government covering grains grown in the Prairie region. Its responsibility is to control, in varying degree, the movement of six grains (wheat, oats, barley, rye, flaxseed and rapeseed) within and out of the Prairies and to sell the wheat, oats, and barley production of the Prairies. Thus, it is a regional board. More than 80 percent of Prairie wheat and 25 percent of Prairie barley is exported overseas. The prices received are determined by world market factors, especially the trade and agricultural policies of other countries. The price received by farmers is a crop year pool price made up of sales on the domestic and export markets. In practice, farmers receive a guaranteed initial price on delivery to their local elevator and any further money as a final payment after the selling year ends, generally 18 months after harvest. The board has a wide ranging and very important role in Prairie grain production and marketing, but concerning price, its effect and influence is essentially limited to that of a very large seller.

SUPPLY MANAGEMENT

The establishment of marketing boards as an operating body to propagate supply management in farm products and agricultural marketing in Canada has been discussed

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[12] H.B. Huff, B.B. Perkins, S.M. Smith, *An Economic Appraisal of the Market for Ontario Flue-Cured Tobacco*, University of Guelph, Publication AE/72/8, August, 1972.

widely among farm organizations, governments and professional groups.[13] The objectives of supply management and of most marketing boards are essentially the same. The emphasis of supply management is centered on orderly marketing -- the orderly delivery and sharing of a particular market among all producers of a commodity so that each benefits from the organized action. Marketing boards frequently add a strong bargaining role in addition to orderly marketing.

There is some evidence that orderly marketing of farm products through the season results in a higher average price to producers. Without an orderly flow to market during the season, prices to producers directly after harvest are often unduly depressed by an oversupply and unduly raised towards the end of the season by shortages. More stable prices can also be achieved with the careful operation of marketing quotas for such products as eggs and broilers.

The question over which arguments range long and hard is, "can supply management and marketing boards raise the level of annual prices received by producers of a particular product over a period of years (i.e. permanently) from what they would have been without such organized marketing action"? The question is serious and significant for those concerned with the farmers' welfare.

The discovery of an ability to achieve a higher price is often confused with the process of orderly marketing, the methods used to achieve it and the results obtained. In Canada, the possibilities for achieving orderly marketing are constrained by the general philosophy and programs of limited price support in order to maintain productive efficiency and international competitiveness. The levels of direct and indirect support to Canadian agriculture are low.[14] In relation to international trade, Canada's tariff and non-tariff barriers to agricultural products are low. Under these conditions two-pricing (or perhaps multi-pricing) to different markets by a monopoly seller is the major practical method to raise prices.[15] The domestic market generally pays the higher price and the export market the lower price. With a relatively small Canadian market, the limitations are considerable and the amount that average producer prices have been raised seems diminutive. A further major problem in answering this question is the continual and extensive fluctuation of world prices.

SUMMARY AND CONCLUSIONS

This review of marketing boards in Canada has analyzed the procedures utilized by the various boards to determine or influence price. Some tentative conclusions can be reached. The operation of marketing boards has ensured that farmers receive equal treatment at the hands of buyers and that through pooling farmers can get the same price throughout the season. There are a few boards, largely those handling fluid milk, that actually determine prices. Further, there is a group of boards, especially the poultry group, which has a major influence on price levels, although limited by international trade flows and prices and by the demand for and supply of other foods. Also, there is another group of boards that negotiates prices with buyers, but it is difficult to determine the extent to which these boards influence the producer price beyond the basic supply and demand situation or expectations of the situation at the time of the negotiations. There are a large number of boards that have, in a variety of ways, improved the organization of the market and thus the price determination and/or prices received by individual producers. Finally, there is a group that influences price through promotion and market development.

The use of various procedures by marketing boards is not mutually exclusive. A few boards have used several, if not all, of the identified procedures. In attempting to classify marketing boards and identify procedures applied, no reflections are intended on their value, efficiency or success, particularly in relation to the attainment of the marketing boards' objectives.

[13] One example is Geoffrey Hiscocks', *Supply Management - Definition Techniques and Implications,* and other papers at the Marketing Seminar of the Rural Learning Association, Ontario, April, 1970.

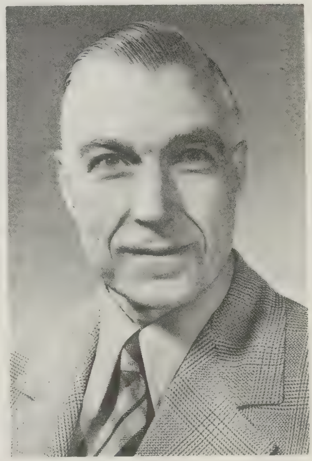
[14] See for example, Review of Canadian Agricultural Policy, OECD, 1973.

[15] Some examples are Western bread wheat, Ontario winter wheat, B.C. Tree Fruits (especially apples), Ontario white beans, etc.

TRANSPORTATION AND HANDLING OF PERISHABLE HORTICULTURAL PRODUCTS

The highly perishable nature of horticultural products requires sophisticated methods of marketing and transportation. Truck and railway are the two major modes of shipment used, with an increasing trend toward truck. Lesser roles are played by air and water.

Thomas A. Bennett *Allan H. Wilmot* *



INTRODUCTION

Horticultural products cover a broad range of some 50 products, including sub-categories of fruits, vegetables, nuts, flowers, nursery stock, and ornamentals. Fruits and vegetables alone provide an estimated 45 percent of the human diet by weight - more than any other food group. In 1972, the total value of wholesale fresh fruits and vegetables sales, alone, was $607.0 million, compared to $871.6 million for the total combined sales of meat and dairy products. About 44 percent of the domestic demand for fresh fruit and about 77 percent of the domestic demand for vegetables are supplied from Canadian production, according to Agriculture Canada estimates. Imports of fruits, vegetables and fruit and vegetable products consumed in Canada are eight times greater than exports.

PERISHABILITY

Horticultural products, especially fresh fruits, vegetables and flowers, are extremely perishable. Because they are living organisms with certain life processes constantly taking place, they demand special care during handling and transportation.

Most horticultural products are extremely tender and susceptible to severe bruising and to high and low temperature injury. They are among the most difficult of all perishable products regarding the establishment and maintenance of optimum handling and transportation conditions.

The rates of respiration and transpiration of such products are particularly important in setting optimal storage conditions during transportation. During respiration a product converts matter into energy, utilizing some of its substrate and O_2 (oxygen). This process results in loss in weight, consumption of O_2 and the release of CO_2 (carbon dioxide) and heat. In the absence of O_2, an organism will produce energy through fermentation, drawing solely upon its own components. During transpiration the product loses water and wilts.

The rate of deterioration as a result of these processes is influenced by the interaction of the relative humidity, temperature, air movement, atmospheric pressure, structure and condition of the product (organism), level of O_2, CO_2 and light within the immediate environment in which the products are stored, transported or handled.

Humidity and temperature are perhaps the most critical factors in transpiration, with temperature exceeding all other factors in importance. The relative humidity must

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not be too high or the growth of micro-organisms will be encouraged. A humidity level that is too low will induce wilting. Commodities vary in their requirements for humidity levels. The optimum level for squash, for example, is 50 percent while a 100 percent humidity level is optimum for horseradish. Temperature directly affects the rate of deterioration and also modifies the effect of the other factors. Temperature requirements also vary widely, ranging from 30 to 60 degrees Fahrenheit.

Deterioration is also induced by other external factors such as impact, compression, abrasion, puncturing, tearing or a combination of these factors. Physiological disorders, largely associated with handling and transportation, are perhaps the most serious in the marketing of perishable horticultural products.

HANDLING

One of the major problems in the marketing of these products is the disregard of their highly perishable nature. This is true at all levels in the marketing channel and is especially evident in handling and transportation. The quality of the product in the field or orchard may often be excellent, but by the time it reaches the consumer, it is in very poor condition from the standpoint of palatability, nutrition and economy. It is also true, however, that if the product is to be of good quality at the retail dock, it must be of good quality and in good condition at the packing house dock.

Before satisfactory distribution services can be performed, horticultural crops must be properly treated, packaged and loaded. Because horticultural products are usually transported considerable distances, physical condition of the fruit must be good at the time of shipment. Packages and containers must minimize deterioration by external factors. In addition, the atmosphere in which products are shipped must be the optimum to minimize physiological deterioration.

Many fresh fruits and vegetables are pre-cooled prior to shipment. This not only reduces loss during handling and shipping, but extends the retail "shelf-life" of the commodity. Pre-cooling is the removal of field heat (the temperature of the organism at the time of harvest). Several methods are used, depending upon the item, including hydrocooling, vacuum cooling and air cooling. Hydrocooling is the use of water for transferring heat from the surface of the product to the cooling medium. The water is cooled by ice or by mechanical refrigeration coils. Vacuum cooling is the process of reducing the atmospheric pressure in hermetically sealed chambers until the reduced vaporizing point permits moisture evaporation to cool the product. The third method, air cooling, uses refrigerated air blown over the fruit as the cooling agent.

Perishable horticultural products require protection during handling and transportation. The type of packages and containers utilized must, therefore, be designed specifically for the individual product. A package (e.g. three-pound polyethylene bags of apples) is basically a retail unit, designed to facilitate sales. A shipping container on the other hand, (e.g. a master container holding 12, three-pound polyethylene bags of apples) is primarily a handling unit to facilitate moving produce from one location to another. Although both may be designed to minimize external disorders, the shipping container provides the major protection during handling and transportation. The package may or may not be the handling container, depending upon the product, its intended use and destination.

To further facilitate handling, containers are often palletized 24 to 60 containers per pallet. This allows nearly complete mechanization by fork-lift from the packing house to the retail outlet. Palletization has many advantages when compared to manual handling. These include lower labor costs, less product and container damage from numerous handlings, and less pilferage of products that, at times, exceeds 10 percent of the value of the product in individual shipments.

Although there are many advantages to palletization it has not yet been universally accepted. The produce industries in both Canada and the U.S. have studied and discussed at great length the issues of standardization of pallets and of widespread adoption. However, there are still several obstacles to their wider use. These include: (1) the high initial cost, weight and expense of returning conventional pallets; (2) the failure of the industry to develop inexpensive disposable pallets; (3) the numerous sizes and shapes of shipping containers; (4) the varying inside dimensions of refrigerator cars and vans; (5) the problem of stacking containers on pallets to provide air movement through the entire load; and (6) the loss of revenue from the space occupied by pallets. The obstacles and issues are gradually being resolved and several produce items, such as cherries and strawberries, are handled almost exclusively on pallets.

Another very important innovation in unitizing the handling and transportation of perishable products is containerization. A large, usually insulated container in which varying numbers of packages or smaller containers are placed, is handled as one unit from the point of

shipment to destination. The containers or units may have individual refrigerating units or plug-in units and may be transported by truck, rail, air, ship or combinations of two or more modes. The two major Canadian railways have container terminals in many of the larger cities in Canada and plan to build such terminals in other cities.

TRANSPORTATION

Transportation is one of the most critical functions of marketing and is often referred to as a function of physical supply. Time and place utility are added to all perishable products transported, thereby enhancing their economic value.

The modern system of highly specialized, but widely distributed production areas, places many demands upon the transportation of perishable horticultural crops. These include that: (1) it be adequate to meet all normal demands; (2) it be fast and minimize the time lapse between production and consumption; (3) it provide the number and variety of services needed to make the marketing channel function with the highest degree of efficiency; (4) the product shipped be protected and transported under optimum conditions to assure minimum deterioration; and (5) the cost of providing transportation be reasonable and in relation to the true worth of the services rendered.

TABLE 1. TRUCK UNLOADS AS A PERCENTAGE OF TOTAL UNLOADS OF SELECTED[1] FRESH FRUITS AND VEGETABLES IN 12 CANADIAN CITIES: 1955, 1965, 1972 AND 1973

	Domestic				Imported			
	1955	1965	1972	1973	1955	1965	1972	1973
				— percent by truck —				
Apples	61.68	74.86	88.09	88.26	42.00	78.60	66.99	53.10
Bananas	—	—	—	—	10.32	79.77	99.12	100.00
Cabbage	89.47	98.16	99.65	99.84	9.91	36.92	54.07	55.82
Cantaloupes	93.22	100.00	100.00	100.00	11.21	16.53	37.89	44.74
Carrots	95.05	95,18	97.82	98.07	13.55	32.16	63.39	59.01
Cauliflower	96.67	99.60	99.98	100.00	19.28	41.76	53.68	63.66
Celery	94.84	98.70	99.89	99.94	7.31	28.89	48.13	48.39
Cherries	23.72	78.71	65.78	53.38	27.55	37.39	62.60	57.25
Corn	98.46	96.90	99.09	100.00	24.17	28.25	72.68	89.75
Cucumbers	89.07	95.18	97.78	99.98	58.07	79.72	85.23	89.42
Grapes	25.11	65.98	100.00	99.33	10.07	19.02	38.46	47.96
Grapefruit	—	—	—	—	35.94	77.23	92.20	90.58
Lemons	—	—	—	—	17.03	25.39	34.04	34.82
Lettuce	94.89	99.85	99.84	99.99	7.42	29.69	33.97	37.47
Mushrooms	100.00	96.69	99.95	100.00	—	100.00	100.00	100.00
Onions	62.13	88.51	94.43	95.41	24.00	32.47	55.76	53.99
Oranges	—	—	—	—	18.78	30.99	37.68	47.97
Peaches	41.26	82.65	97.93	99.98	19.78	67.77	69.79	79.86
Pears	26.25	60.17	61.15	68.90	12.83	30.29	36.76	45.51
Peppers	75.45	97.48	99.71	100.00	46.12	53.34	87.97	86.03
Plums and prunes	33.53	72.53	89.79	94.13	14.25	31.75	28.23	52.95
Potatoes (Irish)	39.41	56.41	64.22	61.54	42.69	27.70	49.58	54.15
Radishes	100.00	100.00	100.00	100.00	40.30	52.92	81.47	89.72
Rutabagas	84.72	95.46	99.46	99.62	77.78	90.32	85.47	95.66
Shallots	100.00	100.00	100.00	100.00	16.56	32.47	45.12	46.49
Strawberries	54.54	96.95	100.00	100.00	4.60	69.67	99.95	99.93
Mandarins[2]	—	—	—	—	21.67	20.58	35.83	36.12
Tomatoes	67.13	95.91	99.69	100.00	8.69	40.38	72.39	73.55
Watermelons	88.89	—	100.00	—	13.65	85.94	72.40	96.10
All Commodities	57. [a]	76.61	80.18	79.17	17. [a]	47.49	60.24	64.06

[1] Each year, the quantity of unloads of all commodities selected constituted between 90 and 95 percent of all fresh fruit and vegetable unloads.

[2] Mandarins or tangerines.

[a] Applies to the sum of above commodities except cherries, corn, lemons, mushrooms, peppers, radishes, shallots, strawberries and mandarins.

SOURCE: Annual Unload Report, Fresh Fruits and Vegetables on 12 Canadian Markets, Markets Information, Agriculture Canada.

TABLE 2. DOMESTIC RAIL AND TRUCK UNLOADS IN 12 CANADIAN CITIES IN 1973 AND PERCENT BY TRUCK IN 1955, 1965, 1972 AND 1973

	Unloads in 1973			Percent by Truck			
	Rail	Truck	Total	1955	1965	1972	1973
		– 000 lb. –			– percent –		
Halifax	3,745	35,427	39,172	56	72	88	90
Saint John	2,803	13,593	16,396	63	75	84	83
Quebec City	13,161	141,260	154,421	55	87	92	91
Montreal	167,645	469,417	637,062	39	73	72	74
Ottawa	28,241	62,027	90,268	54	74	69	69
Toronto	132,625	214,906	347,531	76	76	70	62
Winnipeg	4,086	108,403	112,489	65	85	96	96
Regina	212	28,352	28,564	21	68	97	99
Saskatoon	1,837	19,857	21,694	11	49	84	92
Edmonton	3,214	95,027	98,241	30	65	92	97
Calgary	302	75,702	76,004	32	74	98	100
Vancouver	986	173,174	174,160	88	91	99	99
Total 12 markets	358,857	1,437,145	1,796,002	59	77	81	80

SOURCE: Annual Unload Report, Fresh Fruits and Vegetables on 12 Canadian Markets, Markets Information, Agriculture Canada.

The very perishable nature of horticultural crops has led to sophisticated methods of marketing and, therefore, to highly specialized methods and modes of transportation services. Today, it is an accepted fact that refrigerated transportation is the "lifeline" of marketing high-quality perishable products. The domestic and international distribution of fresh vegetables, fresh fruits, flowers and other highly perishable items would be virtually impossible without the rapid and controlled environment transport that is now available to every major production and market area.

Truck Transport

Truck and railway are the two major modes of transportation used by Canadian shippers of horticultural products, with air and water transport playing lesser roles and the latter mainly limited to external trade. Historically, rail played a very important role in both domestic and import shipments of horticultural products. As both the system of roads throughout the country and trucks improved, the total volume shipped by rail declined. In 1955, about 59 percent of the

TABLE 3. IMPORTED RAIL AND TRUCK UNLOADS IN 12 CANADIAN CITIES IN 1973 AND PERCENT BY TRUCK IN 1955, 1965, 1972 AND 1973

	Unloads in 1973			Percent by Truck			
	Rail	Truck	Total	1955	1965	1972	1973
		– 000 lb. –			– percent –		
Halifax	21,708	25,673	47,381	18	26	53	54
Saint John	7,133	13,281	20,414	27	45	54	65
Quebec City	20,930	79,237	100,167	13	42	77	79
Montreal	338,895	412,949	751,844	22	45	51	55
Ottawa	24,665	81,743	106,408	18	42	75	77
Toronto	424,575	407,545	832,120	11	36	42	49
Winnipeg	16,214	136,936	153,150	18	55	81	89
Regina	2,698	44,648	47,346	0.4	89	92	94
Saskatoon	3,430	41,303	44,733	1.5	67	90	92
Edmonton	10,743	118,210	128,953	4	64	87	92
Calgary	6,394	99,215	105,609	4	67	89	94
Vancouver	70,348	245,505	315,853	48	61	75	78
Total 12 markets	947,733	1,706,245	2,653,978	19	48	61	64

SOURCE: Annual Unload Report, Fresh Fruits and Vegetables on 12 Canadian Markets, Markets Information, Agriculture Canada.

arrivals of Canadian-produced fruit and vegetables on the 12 major Canadian markets were by truck (Tables 1 & 2). This increased to 77 percent in 1965 and to 80 percent in 1973. The volume of imported fruits and vegetables followed a similar pattern. In 1955 only 19 percent of the arrivals were by truck. This increased to 48 percent in 1965 and to 64 percent in 1973 (Tables 1 & 3).

The percentage of arrivals by truck or rail at the major Canadian cities varies considerably by city. For Canadian-grown produce, the range of the truck share of arrivals in 1973 was from 62 percent in Toronto to 100 percent in Calgary (Table 2). Only in Ottawa, Toronto and Montreal did the truck share fall below 80 percent. For imported produce, the corresponding range was from 49 percent in Toronto to 94 percent in Regina and Calgary (Table 3). The lowest percentages of imported arrivals by truck apply to the two terminal market cities, Toronto and Montreal.

There are several reasons for the trend toward shipment by truck. They include speed of delivery, greater accessibility of trucks to the packing stations, and easier direct delivery to the buyer. Furthermore, many shippers and receivers believe that truck shipment is more dependable and much more flexible than rail shipment. A general improvement in equipment and increased load capabilities have also contributed to the greater use of trucks.

TABLE 4. CALCULATED LOWEST PRACTICABLE TRUCK AND RAILROAD FREIGHT[1] RATES OF SELECTED PRODUCTS TO TORONTO BY ORIGIN-(OCTOBER 1973)

		Lowest Practicable Freight Rate	
Product	Origin	Truck	Rail
		cents per cwt.	
Potatoes	P.E.I.	114.4	86 - 87
	N.B.	103.4	84 - 85
	Ont. (Bradford)	27.6	42.3
Apples	Que.	189	183
	Ont.	68.8	105.2
	B.C.	346	331
	N.Y. (U.S.)	136	123
Pears	B.C.	346	331
	Ont.	40	71

[1] Includes perishable protective or heater service. Excludes contract truck rates which could be lower in some cases.

As can be observed from Table 4, rail freight rates, except for short hauls, are lower than truck rates. There is a substantial saving, therefore, that can be made in shipping by rail, rather than truck, if speed of delivery is not a major concern.

SOURCE: Economics Branch, Agriculture Canada.

Truck equipment used to transport horticultural crops is of three general types, with variations within types. The first type is the truck with a refrigerated load compartment carried on a conventional truck chassis. Another is

a refrigerated trailer, usually 40 to 45 feet long, hauled by a tractor. The third type consists of refrigerated containers, 20 to 40 feet long, that can be attached to a truck or trailer chassis, carried on a rail flat car (piggyback), a ships dock or hold, or in the cargo compartment of a large aircraft.

The trailer-on-flat car (TOFC) service, often referred to as piggyback, has had a very rapid growth. With this service, the shipper can take advantage of the flexibility and convenience of trucks and the low cost of rail transport.

Rail Transport

Railroads have been the backbone of industry. For horticultural crops, however, their overall importance has been eroded by the advantages offered by truck transportation. The major advantage that railroads retain over truck transportation is lower rates.

The mainstay of rail service for horticultural crops has been, until recently, the "R&S" car, which is an insulated car with ice bunker. It has, however, gradually been replaced with the mechanically refrigerated "R&P" car, which is also equipped with electric heaters for winter transport of certain crops, such as potatoes.

Another important development in rail service is bulk transportation and handling of such horticultural crops as potatoes. The development of this service has largely been the result of the increased utilization of potatoes for processing. Many of the old "R&S" cars and "R&P" cars have been modified to bulk transport. The principal justification for bulk transport of potatoes and other adaptable perishable commodities include: (1) greater economies of operation through mechanized loading and unloading; (2) the elimination of costly shipping containers that also interfere with heat transfer during transit; and (3) an improved transit environment for the product by circulating air directly to each unit of the product instead of around the containers.

A new concept, the unit-train, has attracted much attention in recent years, especially in the U.S., and may hold some promise for shipment of some horticultural crops in Canada. A unit-train is a set of cars and engines operating as a unit, shuttling back and forth continuously between fixed assembly and distribution points. The concept has gained considerable interest, principally because of the possibility of some rather large rate reductions associated with such a service.

Unit-trains averaging 50 to 70 cars, have been running on an experimental basis between the West Coast and major eastern markets in the U.S. The major objective at the present time is to gain experience with this type of system. "Unit-trains" or "run-through-trains" may play an important part in the produce business in Canada in the future.

Air Transport

A fairly rapid rate of growth has been achieved by air transport in the movement of horticultural crops. Although total shipments by air are not readily available, it is assumed that air transportation is more significant in the import of commodities than in their domestic shipment. A measure of the importance of air transport is the fact that in 1972 this mode was used to move more than 1.8 million pounds of horticultural products, mainly fresh fruits, cut flowers and decorative greens, within Canada and a further 166,000 pounds of fresh and frozen fruits and vegetables, as well as a significant quantity of nursery and greenhouse stock, to foreign countries. In addition, substantial quantities of horticultural products were imported by air in 1972.

The rapid increase in the capacity of aircraft is one of the reasons that the volume handled has increased. Aircraft capacity has grown from $2^3/_4$ tons of cargo capacity with the DC 3 to 110 tons with the B747.

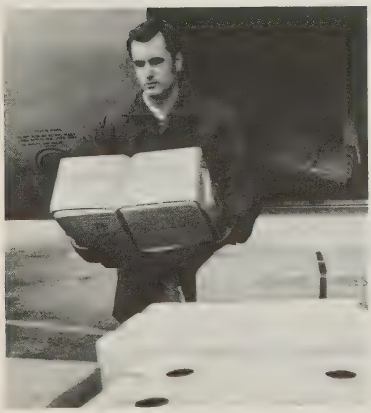
For highly perishable products with a rather high per unit value, such as strawberries, sweet cherries and flowers, air transportation minimizes the transit time from the packing house to the store. Produce items will therefore have a longer shelf life and be of a much higher quality.

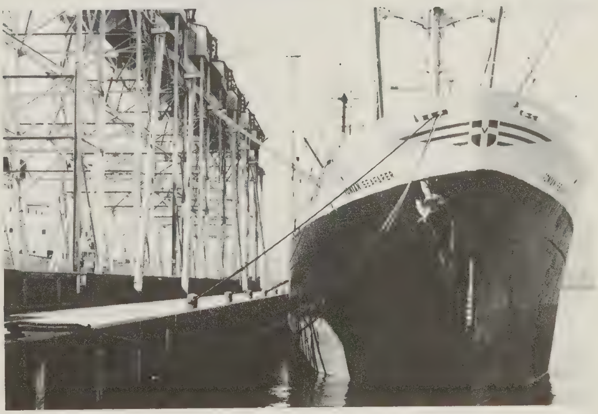
Ship Transport

Ships have been used for centuries to transport food. However, the long transit time was a limiting factor to the type of horticultural crop that could be shipped. The use of refrigerated holds was a large step toward greater utilization of ship transportation of perishable horticultural crops. The next step was the use of refrigerated containers which permitted some degree of unitization. Today, the ultimate in efficient ship transportation is the specially designed and built container ship. Such ships carry over 1,800 containers 20 feet in length. It has been estimated that containerized shipping eliminates up to nine different handlings.

INTRANSIT TIME AND FREIGHT RATES - RAIL AND TRUCK

The two major modes of transportation in Canada, rail and truck, each have particular advantages and disadvan-





tages. The major advantage of truck transportation is speed of delivery, while the major advantage of rail transportation is lower freight rates.

Intransit time by rail is generally longer than by truck, even for long distance hauls. From California to Ottawa, for example, rail transit time is approximately seven days, while truck transit time is about five days. Tomatoes shipped from Mexico can be delivered by truck to Ottawa in five days, while rail shipment requires up to nine days. Cabbage, celery or other produce shipped from Florida to Ottawa by rail requires ten days and truck delivery averages about two days. The greater speed of delivery by truck as compared to rail is especially important in the transport of premium quality, highly perishable produce.

The cost of transportation is also very important, especially for less perishable commodities such as potatoes. Most of the potato shipments to the Toronto

market originating in New Brunswick and P.E.I. are by rail. Also, apple and pear shipments to Toronto from British Columbia are by rail. Rail transit time to Toronto from British Columbia is approximately seven days and from P.E.I. and New Brunswick about four days. Although truck transport would be faster, the major factor considered is the lower level of rail freight rates.

It is very difficult to compare truck and rail rates because of the many variable services that may be required and because of the various methods in calculating charges. It is possible, however, to develop somewhat comparable rates using the lowest practicable freight rate for each mode. Using Toronto as the destination, rates by product and origin can be compared.

CONCLUSION

Most horticultural crops have very exacting climatic and soil requirements that limit the areas of production, which are generally great distances from the major consuming centres. Transportation, therefore, plays a large part in the success and growth of the horticultural industry.

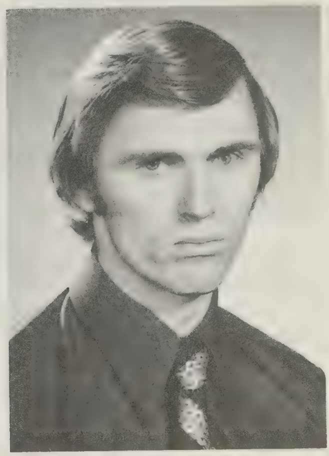
Because of their extreme perishability, severe restrictions are placed upon the post harvest handling and transportation of horticultural crops. The equipment and techniques utilized, therefore, must be designed specifically for them.

Transport carriers are often criticized by shippers for not modernizing their services in relation to changes within the produce industry. The fact that the equipment and services offered by rail and truck carrier, for example, have not yet reached the ideal for transporting perishable horticultural products to market is evident from the millions of dollars that are paid in claims to shippers and receivers in both Canada and the U.S. The horticultural industry is very critical of railroads and other carriers in their lack of sufficient research into new equipment and techniques. Shippers are also critical of transport carriers because of their inability to furnish sufficient equipment during the peak seasons and because of the inability of some carriers to maintain specific scheduling.

At present, our agricultural research appears to be more directed toward changing or improving the post harvest carrying quality of produce than toward the improvement of the carrier. Perhaps what is required at this time is more intensive research into improving equipment and techniques of handling and transporting fresh produce. The challenge, therefore, to the transportation industry and to the supporting research institutions is to provide the number and variety of equipment and the necessary techniques to meet the needs of today's modern horticultural industry.

PROTEIN MEAL MARKETS - PAST PERFORMANCE AND FUTURE PROSPECTS

The year 1972-73 saw a dramatic increase in protein meal prices. A major cause was production failure in a year when stocks were depleted. Although prices have declined substantially from their peak in 1973 they will not likely return to levels prevailing at the beginning of 1972.



B.W. Paddock *

INTRODUCTION

In world markets for protein meals, 1972-73 will be a year to remember. Beginning at levels which were already high by historical standards, prices soared to record levels. The Food and Agriculture Organization (FAO) price index for oilcakes and meals rose from 137.6 in September 1972 to a record 448.1 in July 1973 and averaged 250.4 for the 1972-73 season. The question now is whether the underlying supply-demand balance has been permanently altered or whether the recent price boom was just another cyclical high point (although more exaggerated than previously experienced) in oilseed prices. Many factors contributed to the rapid escalation of prices. The more critically important of these will be analyzed in order to identify which, if any, represent a permanent shift in either the supply of or the demand for protein meals and which factors are cyclical or temporary in nature. This analysis is intended to provide some insight into the future direction which oilseed and protein meal prices are likely to take. It is useful first, however, to examine some of the market characteristics and trends which had been developing before 1972-73.

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BACKGROUND

Rapid Growth

The first characteristic worth noting is the relatively rapid growth which both production[1] and international trade of protein meals have shown. From a level of 21 million metric tons in 1959-60 production has increased at an average rate of 5.3 percent per year to 42 million metric tons in 1971-72. Although the amount of increase did vary substantially from year to year, production declined in only one year, 1962-63, when reduced output of sunflowerseed meal in Argentina and rapeseed and soybean meals in most exporting countries caused a 2.1 percent decrease in protein meal production. However, as a result of an 18.7 percent increase in meal production the previous year, opening stocks were such that total protein meal supplies in 1962-63 were higher than the previous year despite the reduced output. International trade has increased at an even faster rate than production, growing at a rate of 8.2 percent per year, from 9.3 million metric tons in 1960

[1] Production data cited include production by countries which participate in international protein meal trade. Data also omit the production of palm kernel meal or copra meal, both of which provide only small quantities to world markets.

to 23.9 million metric tons in 1972. These figures alone, however, do not by themselves adequately describe the situation. If the production of soybean meal is excluded the growth rate drops to 3.8 percent, while if both soybean and fish meal are excluded, the rate is only 2.9 percent. Thus, the growth of output of the other protein meals (with the exception of rapeseed meal) has not been nearly as fast as the rate for protein meals as a group. It is significant to note, however, that despite the marked increase in the production of protein meals in the 1960's, the increase in meal prices over the period would indicate that demand increased even faster.

Market Shares

A second characteristic is the market share which the various meals hold both in terms of production and international trade. It is also useful to identify the countries which are the main producers and exporters of each protein meal. The production and international trade shares and their development during the 1960's are summarized in Figures 1 and 2.

Soybean meal is increasingly the most important protein meal, dominating both production and international trade. During the 1960's the proportion of protein meal production accounted for by soybean meal rose from 51 to 60 percent[2] while its share of international trade increased from 47 to 65 percent. One contributing factor to the growing importance of soybean meal is that its meal content (79.5 percent) is higher than that of other oilseeds. The main sources of soybean exports are Brazil and the United States. The United States is by far the largest exporter, accounting for 91 percent of soybean meal exports in the early 1970's. However, supported by a sharply increasing rate of production, exports from Brazil increased from a negligible level in the early 1960's[3] to 6 percent of soybean meal exports by the end of the decade.

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[2] To make comparisons more meaningful, production and trade data for meals are converted to a base protein value of 45 percent.

[3] The level used for the early 1960's is the average of the years 1959-60 to 1961-62.

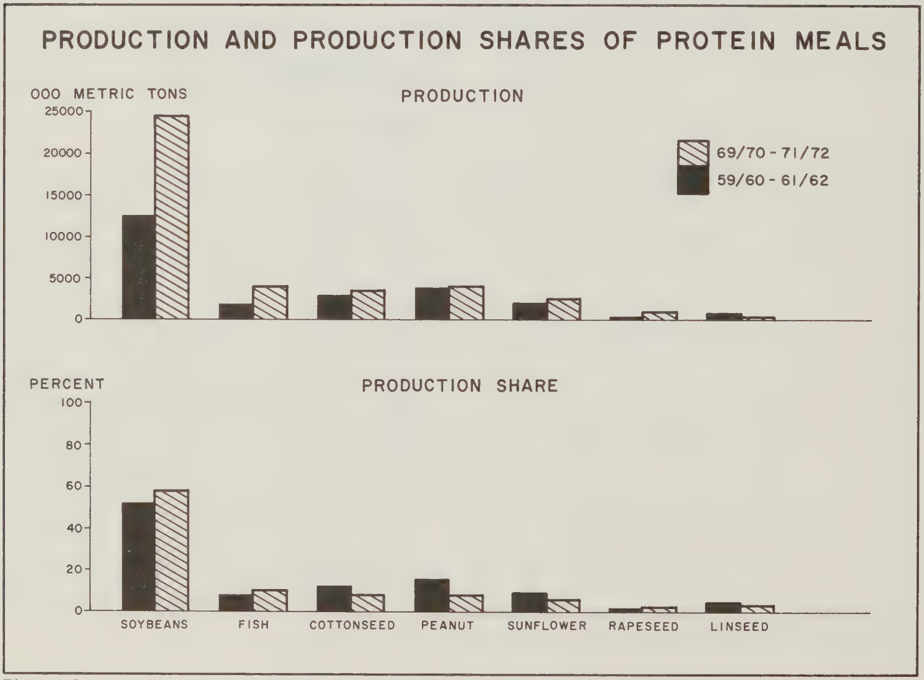

Figure 1

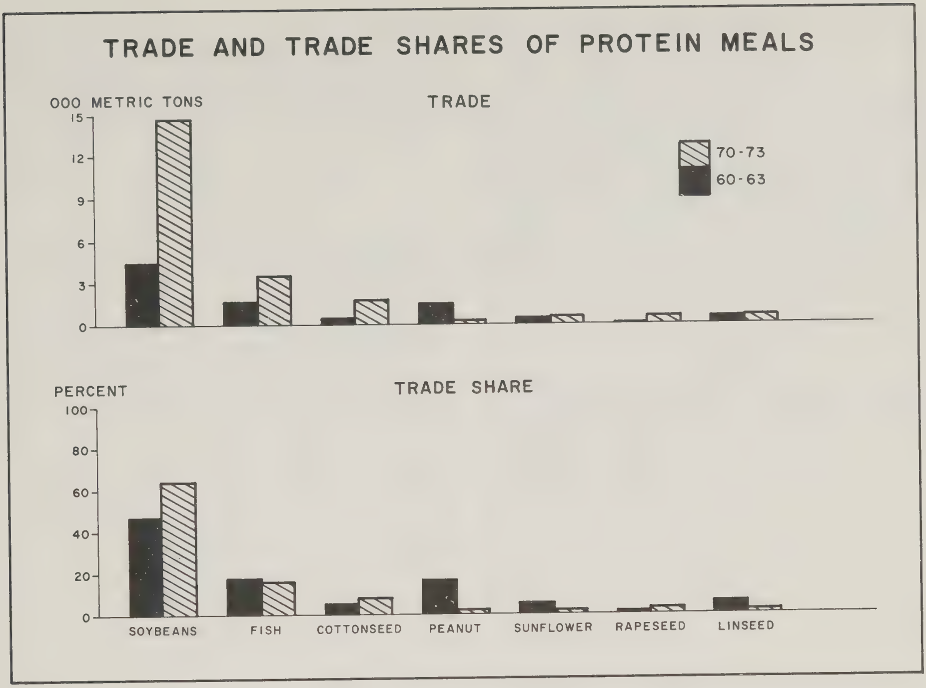

Figure 2

Fish meal is also a very important source of protein meal, accounting for 10.5 percent of production, up from a 7.5 percent share of production in the early 1960's. Although its exports more than doubled during the 1960's its share of international trade in protein meals dropped from 18 to 16 percent. The fish meal industry in Peru grew very rapidly during the 1960's. Production increased from 0.577 to 1.935 million metric tons while exports rose from 0.757 to 1.706 million metric tons. The production and exports of fish meal from Chile and Denmark have also shown rapid growth but from a smaller base. Other sources of exports are South Africa, Norway and Iceland.

Three other meals each account for between 7 and 10 percent of meal production. Cottonseed meal production during the 1960's increased little, from 3.8 to 4.0 million metric tons, while its production share decreased from 15.8 to 9.7 percent. The leading producers include the U.S.S.R., the United States, India and Pakistan. Cottonseed is not an important meal in international trade, accounting for only 2.6 percent, down from a 5.3 percent share in the early 1960's. The major exporting countries are Turkey, Brazil, the Sudan, India and Argentina.

In terms of production, peanut meal is slightly less important than cottonseed meal. Although production increased from 3.0 to 3.5 million metric tons during the 1960's, its share of total meal production declined from 12 to 8.5 percent. The major producers of peanuts include India, the United States, Nigeria, Senegal and Brazil, with India the largest producer. Peanut meal is more important in international trade than corresponding production data would indicate. Although its trade share declined sharply from 16.5 percent in the early 1960's, it accounted for 8.3 percent of international trade in the early 1970's. The major exporters are India, Nigeria, Senegal, Brazil, and Argentina.

Sunflowerseed meal is less important than peanut meal, accounting for 6.8 percent of meal output in the early 1970's compared with 8.6 in the early 1960's. Production during that period increased from 2.1 million to

2.8 million metric tons. The main producers are the U.S.S.R., Argentina, Turkey and Bulgaria, with Turkey and the U.S.S.R. being by far the largest. In terms of international trade, sunflowerseed meal is relatively unimportant. Sunflowerseed meal exports during the 1960's fell from 7.8 to 6.4 percent of world trade in protein meals. Argentina and Turkey are the principal sources of exports of sunflowerseed meal, accounting for 80 percent of total exports. A leading exporter of meal in the 1960's, the U.S.S.R., sharply reduced its exports in the early 1970's, presumably in response to smaller sunflowerseed crops and larger domestic meal requirements.

Two other crops supply minor quantities of meal to international markets. Production of linseed meal showed a very small increase in the 1960's while its share of meal production dropped from 3.4 to 2.2 percent. The major producers of linseed meal are Canada, the United States and Argentina. In terms of international trade, linseed meal has also declined in importance, from a share of 6.5 percent in the early 1960's to 3.1 percent in the early 1970's. Canada, the United States and Argentina are also the major sources of linseed meal exports.

Rapeseed meal production, while small, has shown rapid specific growth. From a production share of 1.2 percent in the early 1960's its contribution has increased to 2.8 percent in the early 1970's. Canada, Poland, France and West Germany are the leading producers with Canada being the largest. In international trade the importance of rapeseed has more than doubled from a share of 1.2 percent in the early 1960's to 2.6 percent in the early 1970's. Canada is the most important exporter, followed by France, most of whose exports are intra-Economic Community.

Low Stocks

A final characteristic to note is the low level of stocks. For the period 1959-60 to 1971-72 the average level of stocks among major producer-trading nations was 3.4 million metric tons. During this period exports averaged 16.4 million metric tons, i.e., stocks were sufficient to fill export needs about one-fifth of a year or about 11 weeks. Furthermore, over the same period, 86 percent of these stocks were held by the United States in the form of soybeans and to a lesser extent, flaxseed and soybean meal. Other minor stocks were in the form of Peruvian fish meal, Canadian rapeseed and Canadian flaxseed. It should also be noted that since 1960-70, opening stocks of protein meals declined yearly until at the beginning of 1972-73, stocks were down to 2.4 million metric tons, less than 10 percent of exports in 1972. Thus, meal supplies had become increasingly dependent upon current production levels and as a result small variations in production had a larger impact on the supply situation.

ANALYTICAL FRAMEWORK

To facilitate the integration of the factors to be discussed, it is useful to briefly describe the price determination mechanism as it relates to protein meals. On the supply side within the crop year, the responsiveness of meal production to economic factors is almost non-existent. Crops have been planted before the beginning of the crop year and there is little which producers can do to adjust production in response to changed economic conditions. This means that the short-run elasticity of protein meal production is virtually zero. The only other source of supply is from adjustment in the level of stocks, a process which is responsive to economic conditions. Generally, when prices are high, stocks are reduced, while when prices are low, stocks are replenished. Thus, the supply from stocks will possess a degree of elasticity. Although the degree will depend upon the behaviour of the owners of stocks, one would expect the supply from stocks to be less elastic as one moved along the supply curve upward to the right. This would reflect the limitation of the supply by the actual stock level and the increasing physical difficulty of reducing stocks as their level falls. The total supply curve is the summation of the supply from current production and stocks. Thus, the elasticity of aggregate supply depends upon the elasticity of supply from stocks which in turn is a function of their actual level and the proportion of total supplies which are made up by stocks; that is, if stocks form a relatively large proportion of total supplies, the elasticity of supply will be greater than if stocks form only a small proportion of total supplies.

Although it is more responsive to economic conditions during the year than the supply from production, there is a considerable degree of rigidity in the short-run demand for protein meals. At the beginning of the year, there is a given livestock population, the feeding programs for some of which are quite rigid. Least cost rations are formulated on the basis of nutrient composition of input feedstuffs and minimum nutrient requirements of livestock. For some classes of livestock, the consequences of feeding levels of protein below the minimums specified can be quite severe while the benefits from over feeding protein are often quite small. These rigidities tend to make the demand for protein meal somewhat inelastic. For example, the price elas-

ticity of demand for soybean meal in the United States has been estimated on an annual basis to be -0.33. Obviously, the longer the time period allowed the more elastic the demand will be, particularly if the time period is long enough to allow the livestock feeders to reduce livestock numbers in response to protein prices.

The analytical framework just described is illustrated in Figure 3 where "SP" is the supply from production, "SS" is the supply from stocks and "D" is the demand, and where the subscripts indicate the year to which each curve applies. Having established the analytical framework, it is now appropriate to proceed to examine those factors which influenced protein meal prices in 1972-73.

ANALYSIS

The factors which contributed to the escalation in meal prices in 1972-73 can be divided according to whether they affected primarily the supply or the demand for protein meals. The discussion of the supply side will deal with the levels of production and total supplies which were available for consumption in 1972-73. On the demand side, factors such as livestock populations, exports commitments to the U.S.S.R. and the effects of currency devaluation will be considered. Finally, an effort will be made to examine the above factors to determine whether they are likely to be of a permanent or temporary nature.

Small Increase in Production

An important factor which contributed to the escalation in protein meal prices was the unusually small increase in production during 1972-73. Production in major exporting countries increased by only 0.8 percent to 42.8 million metric tons compared to an average annual increase of 6 percent for the period (See Table 1). The main reason for the small increase was the reduced output of both fish and peanut meal. The former fell by 1.1 million metric tons as over-fishing and unfavorable environmental factors combined to reduce production in Peru and Chile by more than 50 percent. Production of peanut meal was reduced by more than 0.65 million metric tons as a result of drought in both India and East Africa, particularly Senegal. In total, the reduction in fish meal and peanut meal production was equivalent to 2.3 million metric tons of soybean meal or about 10 percent of international meal trade in 1971.

Production of sunflowerseed, rapeseed and linseed meals were also reduced, although to a lesser extent. The reduction in sunflowerseed meal production resulted from lower acreage and yields in the U.S.S.R. Sharply decreased rapeseed acreage in Canada was the cause of the reduction in rapeseed meal production. For linseed meal, reduced production in Canada and the United States outweighed increased production in Argentina. In the case of the latter two meals, an improved supply-demand-situation for cereal grains was probably the

TABLE 1. PRODUCTION OF PROTEIN MEALS IN SELECTED COUNTRIES

(000 MT Soybean Meal Equivalent)

	Soybean	Fish Meal	Cottonseed	Peanut	Sunflowerseed	Rapeseed	Flaxseed	Total
1955/56	7,683	580	3,648	2,203	1,810	95	800	16,819
56/57	9,232	590	3,520	2,377	1,750	247	1,210	18,926
57/58	9,932	600	3,246	2,653	1,410	258	780	18,879
58/59	11,890	920	3,364	2,728	1,930	263	960	22,035
59/60	10,964	1,280	3,718	2,649	1,810	173	800	21,394
60/61	11,460	1,820	3,759	3,020	2,060	317	850	23,276
61/62	14,621	2,330	3,926	3,214	2,370	399	780	27,640
62/63	13,849	2,600	4,022	3,200	2,190	274	920	27,055
63/64	14,459	3,260	4,190	3,312	2,000	386	930	28,537
64/65	14,522	3,270	4,339	3,689	2,690	560	870	29,940
65/66	17,598	3,770	4,339	3,460	2,470	562	980	33,179
66/67	19,353	3,840	3,744	3,380	2,850	767	770	34,704
67/68	20,341	4,830	3,636	3,608	2,960	808	510	36,693
68/69	23,048	4,100	4,271	3,201	2,934	561	760	38,875
69/70	23,825	4,540	3,777	3,396	2,986	835	990	40,349
70/71	24,215	4,720	3,829	3,501	2,785	1,241	1,170	41,461
71/72	25,866	3,740	4,472	3,698	2,690	1,416	590	42,472
72/73	28,678	2,130	4,748	2,964	2,595	1,173	520	42,808
73/74	35,889	2,537	(4,972)	3,673	3,043	1,206	508	51,628

main factor contributing to the diminished production, although a record level of 16 million bushels of carry-over stocks of rapeseed on farms at the end of 1971-72 probably also acted as a deterrent to Canadian rapeseed production in the following year.

Production of cottonseed meal and more particularly soybean meal did increase. Cottonseed meal production rose in all the major producing countries except Turkey and India, with production in the United States showing the biggest increase. Soybean meal output showed the sharpest growth as production in both the United States and Brazil expanded. However, these increases were not achieved easily. Unfavorable weather in the United States delayed completion of the harvest until January 1973. This delay resulted in soybean yield losses which totalled 50 million bushels. In addition, the meal yield per bushel was lessened by about 1 percent. In total, the adverse weather reduced potential soybean meal production in the United States by about 1.3 million metric tons. The increases in soybean and cottonseed meal production, nevertheless, were sufficient to offset the shortfalls of reduced production of other meals and caused a small growth in total meal production.

Low Stocks

In addition to the unusually small increase in meal production, stocks of protein meals were at the lowest level in several years. Stocks of soybeans in the United States were only 60 million bushels at the outset of 1972-73, less than one-fifth their level of three years

TABLE 2. LIVESTOCK NUMBERS IN SELECTED COUNTRIES

(000)

Type of Livestock	Time	71/72	72/73	%
	United States			
Cattle on feed (23 States)[1]	Dec. 1	7,723	8,446	+9
Hog Inventories[1]	Dec. 1	62,507	61,502	−2
Poultry Inventory[1]	Dec. 1	425,576	406,241	−4.8
Broiler Placements[1]	Aug – Dec	1,101,488	1,221,233	+9.8
Turkey Poults Hatched[1]	Sept – Feb	37,474	40,699	+8.6
	Canada			
Steers	Dec. 1	4,920.0	5,137.2	+4.4
Heifers[3]	Dec. 1	1,061.2	1,072.1	+1.0
Hogs on farms[3]	Dec. 1	7,388	7,301	−1.2
Laying Pullets[2]	Dec. 1	23,400	23,100	−5.6
Broiler Placements[2]	July – Dec.	96,745	106,367	+9.9
Turkey Placements[2]	July – Dec.	6,498	7,135	+9.8
	Western Europe			
Cattle[1]	Jan. 1	87,181	89,475	+2.6
Hogs[1]	Jan. 1	86,823	87,786	+1.5
Poultry[5]	Jan. 1	337,779	340,594	+0.8
	Eastern Europe			
Cattle[1]	Jan. 1	35,621	36,742	+3.1
Pigs[1]	Jan. 1	37,790	59,617	+3.2
Poultry[5]	June 1	596,950	617,914	+3.5
	Japan			
Cattle[1]	Jan. 1	3,568	3,485	−2.3
Hogs[1]	Jan. 1	6,985	7,430	+6.4
Poultry[4]	Mid-Year	225,088	222,661	−1.1

SOURCES: [1] United States Department of Agriculture
[2] Canada Department of Agriculture
[3] Statistics Canada
[4] Food and Agriculture Organization
[5] Oil World

earlier. This meant that even at the beginning of 1972-73, the elasticity of supply for that year could have been described as almost zero. Thus, when the increase in protein meal output amounted to less than one seventh its usual size, the entire burden of adjustment was shifted to the demand side.

Strong Demand

On the demand side, three factors had a major influence on protein meal prices. The first was the strong underlying demand structure which was carried into the crop year. As shown by the data in Table 2, in most meal consuming nations, livestock and poultry numbers (particularly those of fed cattle, broilers and turkeys) were significantly above those of the previous year. This precipitated a situation in which a larger "consumer population" was forced to compete for protein meal supplies which were 1.8 percent lower than for the previous year. The result was a strong surge of upward pressure on meal prices as livestock producers throughout the world scrambled to obtain meal supplies.

Imports by U.S.S.R.

A second factor, somewhat related to the factor discussed above, was the entry of the U.S.S.R. into the protein meal market as a major importer. Historically, the U.S.S.R. has been an exporter of sunflowerseed meal. In the late 1960's its exports averaged 292 thousand metric tons (275 thousand metric tons of soybean meal equivalent) and accounted for 36 percent of sunflowerseed meal trade, second only to Argentina. In 1972-73, the U.S.S.R. imported 40 million bushels of soybean meal from the United States, the equivalent of 813 thousand million metric tons of soybean meal. This new source of demand was equal to 4 percent of international meal trade in 1972 and one half the normal annual increase in total international trade in protein meals. In normal years with larger stocks, the effect of such a new source of demand probably would have been much less. However, when this new demand emerged during a year when supplies were already very tight and when the elasticity of supply was very low because of the low level of stocks, the impact upon meal prices was much more pronounced.

Realignment of Currency Relationships

A third factor which strongly influenced meal prices in 1972-73 was the major realignment of currencies, particularly the subsequent devaluation of the American dollar relative to the Japanese yen and most Western European currencies. The devaluation made protein meal imports from the United States (as well as from other countries whose currencies were devalued with the American dollar) cheaper than they would otherwise have been. By partially offsetting part of the price increases due to other factors, devaluation of the American dollar placed many major importers in an improved buying position relative to consumers in countries whose currencies were devalued. In effect, the devaluation served to shift upward and to the right the foreign buyers' demand curves for protein meals.

The degree by which individual currencies were revalued varied from May 1971 until September 1973. The value of the American dollar, for example, fell by 32 and 40 percent relative to the value of the German mark and the Japanese yen respectively. When the currency adjustments were weighted by the volume of imports of oilseeds and oilseed products, the average devaluation was estimated to be about 14 percent[4]. According to a study of the American soybean industry[5], the price elasticities of export demand for U.S. soybean meal and soybean are -0.33 and -0.32 respectively. Since those countries whose currencies were devalued import most of their protein meal requirements and since United States soybean meal forms the largest part of world protein meal exports, it seems reasonable that the elasticity of demand for United States meal exports would approximate quite closely the price elasticity of total meal demand in those markets. Assuming this to be so, the 14 percent devaluation of the American dollar cited above would induce a 4.7 percent increase in the quantity of oilseed products demanded. This new addition to demand contributed further to the rapid increase in meal prices in 1972-73.

A summary of the impact of the previously discussed factors is presented in Table 3. These factors combined to stimulate an increase in import demand of 17.2 percent. In the same year, total meal supplies were 1.8 percent lower than in 1971-72. Furthermore, stocks were at such a low level that a further reduction would have been very difficult. The situation is illustrated in Figure 3. As shown, the supply from production in 1972-73 (SP*72-73*) was slightly greater than for the previous year, while the supply from stocks (SS*72-73*) was noticeably less than for 1971-72. Combining the supply curves from stocks and production results in a market supply curve (TS*72-73*) which is to the left of

[4] United States Department of Agriculture, World Agricultural Situation - December 1973.

[5] J.P. Houck and J.S. Mann, Domestic and Foreign Demand for Soybeans and Soybean Products, Technical Bulletin 256, Agricultural Experiment Station, University of Minnesota.

the one for 1971-72. The demand curve (D*72-73*), on the other hand, is to the right of the one for 1971-72. Because of the inelasticity of the supply and to a lesser extent the demand, the price in 1972-73 (P*72-73*) is sharply above the price in 1971-72.

TABLE 3. FACTORS INFLUENCING PROTEIN MEAL PRICES IN 1972-73

Demand	%
Normal Increase in Import Demand	8.5
Soybean imports by USSR	4.0
Devaluation of American Dollar	4.7
Total	17.2
Supply	
Production	+ 0.8
Beginning Stocks	– 41.7
Supplies	– 1.8

FUTURE OUTLOOK

Having reviewed the relevant trends in the protein meal market and assessed the factors which contributed to the acute increase in prices during 1972-73, it is now relevant to attempt to project this analysis forward somewhat. In order to do this, each one of the factors previously discussed will be re-examined, this time with a view of forecasting what changes might likely occur in the future.

The unusually small rise in production which was achieved in 1972-73 was in itself exceptional as it involved the simultaneous occurrence of bad environmental conditions (which includes weather and the unusual ocean currents off the coast of Peru) in all six continents. The 1973-74 output of meal is expected to increase by over 20 percent to 51.6 million metric tons as production of soybeans in Brazil and the United States, sunflowerseed in the U.S.S.R. and peanuts in India are noticeably above the 1972-73 level. However, the factors which contributed to the shortfall in 1972-73 have still not been overcome. Although fishing is expected to be fully resumed in Peru in the fall of 1974, it will probably require a number of years for the anchovie population to completely recover and for this recovery to be fully reflected in the quantities of fish meal available on world markets. Furthermore, to the extent that excessive fishing did contribute to the disappearance of the anchovies in 1972, the upward trend in Peruvian fish meal production is not likely to be resumed.

As was earlier discussed, the other factor contributing to the small growth in meal production in 1972-73 was the reduced peanut crop caused by droughts in Africa and India. Although the drought has ended in India, it has continued in much of Africa. Consequently, peanut production in most African countries, with the exception of Senegal, will probably be lower than in 1972-73. This lack of rain has persisted for up to five years in some parts of Africa. In some areas the results have been so severe that the recovery will likely be slow even if the drought should end. Seed shortages and out-migration by inhabitants are two factors which would tend to retard the recovery of peanut production in these areas. The end of the drought would, however, eventually result in increased output of peanut meal.

As was pointed out previously, the largest part of the rise in meal output expected in 1973-74 is the result of sharply higher crops of soybeans in both the United States and Brazil. Consequently, the soybean share of world production and trade in protein meals will continue to increase. Furthermore, the importance of the United States in the production of international trade of protein meals will also expand. The soybean meal share of world meal stocks will also grow. As a result of the sharp expansion in soybean production in the United States in 1973 and the slight reduction anticipated in 1974 plantings, stocks of soybean meal (in the form of soybeans) are expected to be built up to more than five million metric tons. With the depletion of stocks of Peruvian fishmeal, Canadian rapeseed and American and Canadian flaxseed, American soybean stocks will be the world's only significant source of protein meal reserves.

The fact that the 1973-74 rise in protein meal output is dominated by increased soybean meal output is in keeping with the trends in production which have been evident prior to 1959-60. Furthermore, there seems little reason to suspect that these trends will be reversed in the future. In 1974-75 the growth in soybean meal output will slacken should American farmers carry out their intentions of reducing soybean acreage by 3.9 percent. Furthermore, there probably will be increased fishmeal and possibly peanut meal should environmental conditions off the coast of Peru and in Africa respectively improve. However, over the longer term, soybean meal (partly because of the high meal content of soybeans) appears likely to continue to dominate the annual increases in protein meal output. As has been indicated, until recently the United States has controlled the production of soybean meal and to a significant extent the production of protein meals in general. In the United States, the government programs which formerly

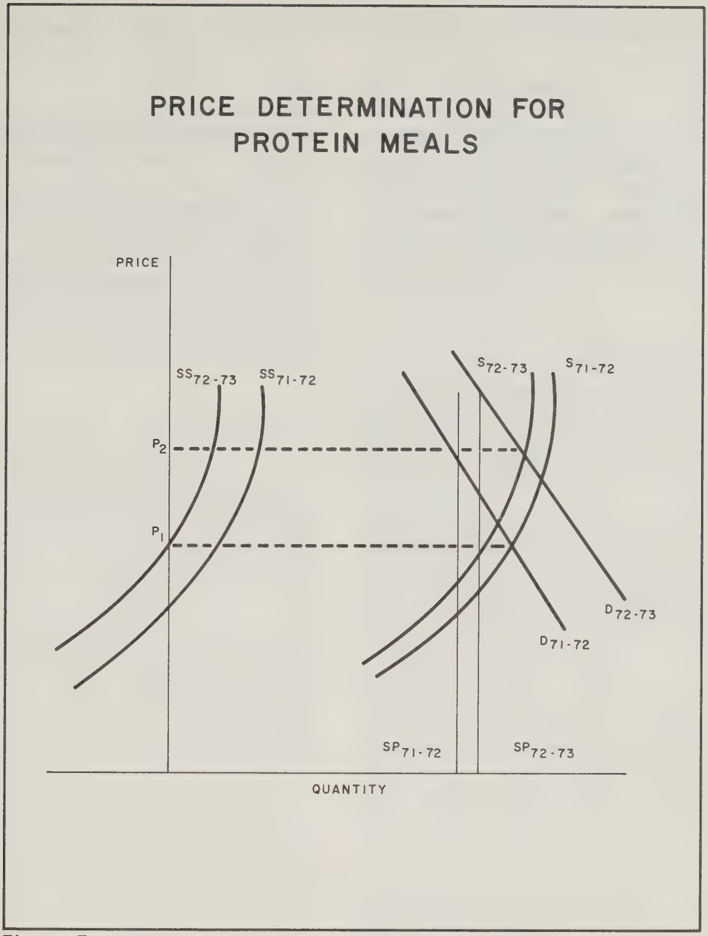

Figure 3

removed large acreages of land from production have been largely dismantled, with much of the land remaining in these programs reputed to be of inferior quality. Future gains in soybean production must therefore come from: (1) soybean acreage expanding at the expense of other crops, particularly corn; and (2) yield increases. Yield increases for soybeans have not been achieved as quickly as for other crops, particularly corn. Should this trend continue, soybean prices will have to increase in the future relative to corn prices if soybean acreage is to continue to rise.

In Brazil, the prospects appear bright for growth of soybean meal production. Soybean output has expanded very rapidly and it is expected to reach about 350 million metric tons by 1980. Until 1973, the rise in output has been largely generated through increased acreage. Yields in the 1960's had increased only slowly and were about 60 percent of those in the United States. The rate of yield expansion has risen in the 1970's, however, and in 1973 a yield of 25 bushels per acre was achieved. In Argentina also, production of soybeans has grown sharply in recent years. Spurred by recent high prices of protein meals, a number of countries have initiated or accelerated programs to establish production of oilseeds. While few of these countries have large output potential, these programs may be able to reduce the dependency of these countries on imported protein meals. The case of Thailand may be an exception. Considerable work is being expended in an effort to establish soybean production in Thailand with the view that it is a potential source of export supplies. At least partly offsetting increased production, however, is the

fact that as domestic demand for protein meals begins to grow in developing countries, it will increasingly cut into export supplies even though production may rise. Argentina seems to be a case in point. The proportion of Argentinian meal production consumed domestically has increased from an average of 6.8 percent in the years 1960-63 to 20.6 percent in 1970-73. Thus, a large part of any growth in soybean production in Argentina is unlikely to get into export markets. Although consumption is also increasing in Brazil, thus far, production has advanced at such a rate as to allow an increase in exports as well.

As discussed earlier, a second factor which influenced 1972-73 prices was the large imports of the U.S.S.R. In part, these were the result of reduced domestic production of sunflowerseed meal. Because of the sharp upsurge in sunflowerseed meal in the U.S.S.R., it would appear that additional imports of protein meals will not be required in 1973-74. However, should they continue to increase the size of their livestock herds, the U.S.S.R. could well be a future importer of meal. In addition, 1973-74 has seen the entry of the People's Republic of China into the protein meal market as an importer of 0.9 million metric tons of soybeans (0.7 million metric tons of meal). With their immense populations, both the U.S.S.R. and China are potentially large markets for meal should their governments decide to encourage production of greater quantities of livestock products for domestic consumption. However, since the U.S.S.R. is itself a large producer of protein meals, exports to that country will likely be irregular depending on domestic production.

The third factor which affected meal prices in 1972-73 was the revaluation of the currencies of many meal-importing countries relative to the American dollar. Since September 1973, however, the value of the American dollar has rebounded quite noticeably and by the end of February, it has risen by between 6 to 12 percent relative to major world currencies. Future relationships among currencies are difficult to forecast. The effect of currency realignments on the balance of payments are well recognized. Until recently, however, the effects of such realignments on individual commodity prices, while implicitly recognized, has not been given significant prominence. In light of the recent instability of currency relationships, however, the effects of these relationships upon commodity prices must be dealt with more explicity. While continued fluctuation in currency relationships can be expected, to the extent that at least part of the devaluation which occurred between May 1971 and September 1973 remains, it will contribute to a stronger demand for exports of all types including protein meals.

CONCLUSION

In conclusion, it seems that the supply-demand balance for protein meals has been altered somewhat. Some of the factors which caused the dramatic increase in prices in 1972-73 would appear to be at least quasi-permanent in nature. The devaluation of the American dollar, to the extent that it is maintained, will continue to contribute to increased demand for protein meals as well as other commodities. Higher incomes (through their effect on demand for livestock products) are also likely to add to further demand for protein meals. As earlier discussed, a major cause of the sharp increase in meal prices in 1972-73 was the failure of production in a year when stocks were depleted. The prospect of the re-occurrence of this situation is temporarily precluded by the large upswing in meal production in 1973-74 and the subsequent build-up of stocks in the United States. However, in the longer term, increases in meal production are likely to be more difficult to secure as oilseed production is required to compete for available land resources. While prices have declined substantially from their peak in 1973, it would seem unlikely that prices will return below the levels prevailing at the beginning of 1972-73.

POLICY AND PROGRAM DEVELOPMENTS

PRAIRIE GRAIN ADVANCE PAYMENTS ACT

(Amendment to Payment Regulations)

The amendment increases from $6,000 to $15,000 the maximum that may be paid in advance to a producer in respect of grain to be delivered under a permit book. Where two or more shareholders farm an incorporated farm, the cash advances are based on $15,000 times the number of shareholders. The maximum cash advance is $45,000.

AGRICULTURAL STABILIZATION ACT

(Beef Stabilization Regulations No. 2)

Beginning April 29, 1974, the Government undertook to pay a premium of 3 cents per pound on Canadian cattle graded A, B and C and marketed for immediate slaughter. The premium remained in effect after the dissolution of Parliament in May 1974.

This temporary program was designed to be phased out, as requested by the producers' association, "when the market returns to normal." The regulations enable the producer to be paid the premium by the buyer (whether a small scale abattoir or a big packer) at the time of sale, and the buyer to be reimbursed by the Government.

The first premium announced under the program was 7 cents on the pound, effective March 18, for all Canada Grade A cattle. A retroactive period was provided to assist producers who had marketed in the period March 4-18. This was based on 5 cents a pound on A, B and C grades, or 7 cents on A 1 and A 2. This was subsequently revised (April 1) to 5 cents a pound on all grades A, B and C cattle marketed for slaughter. Grades D and E were excluded. The revised premium of 3 cents came into effect on April 29.

CANADA AGRICULTURAL PRODUCTS STANDARDS ACT

(Lamb and Mutton Carcass Grading Regulations)

Effective April 11, the new grading regulations for lamb and mutton carcasses were implemented by a new system for grading Canada Grade A lamb carcasses into four fat-content levels. Carcasses are branded with colour-coded ribbon brands to identify quality. Grades are A (red colour code), B (blue), C (brown), D (black) and E (black). Grade A is subdivided into four fat-levels, 1 being the lowest, and 4 the highest. B and C are not subdivided, as they usually contain less fat than is considered desirable. Grade D, indicating mutton, designates mature animals and is subdivided into four quality levels. Grade E is for mature males. The system is designed to enable the buyer to identify the quality and fat-level he prefers.

MEAT INSPECTION ACT

(Amendment to Meat Inspection Regulations)

This amendment, as originally printed in the Canada Gazette (May 8), introduced substantial changes in Sections 6, 12, 13, 14, 65, 76 and 87 of the Act. However, these sections are being further amended or rescinded.

It is now established that the amended versions of Sections 12, 13 and 14, covering hours of inspection, have been rescinded and the original versions have been reinstated. This means that the Department of Agriculture will continue to supply 40 hours of free inspection per week, $8^1/_2$ hours in any one day, and during the hours of second or third shifts.

ANIMAL CONTAGIOUS DISEASES ACT

(Compensation for Diseased Cattle)

Section 156-0 of the Animal Contagious Diseases Regulations has been amended to increase the maximum amount of compensation payable to livestock owners whose cattle are ordered slaughtered due to tuberculosis, brucellosis and Johne's Diseases to $450.00 from $300.00 for purebred or recorded cattle and to $200.00 from $150.00 for grades.

The amendment applies to animals ordered slaughtered on or after March 26, 1974, and is made retroactive to cover animals ordered slaughtered on or after January 1, 1974.

CANADA AGRICULTURAL PRODUCTS STANDARDS ACT

(Egg Regulations)

Under this revision of 1959 regulations, new grade names and new packaging requirements are established, and conditions for interprovincial trade and importing eggs are laid down.

Grade names are now incorporated in a maple leaf outline. A new grade, "Canada C", may be packed by

registered stations and producer-graders. "C" can be a mixture of qualities and sizes and can only be sold to egg processors.

"Canada Cracks" are eliminated as a grade. Cracked eggs can be sold only as "Canada C" to a processor.

Tolerances for under-grade eggs at point of origin are slightly increased; those at point of destination are decreased.

Ungraded eggs can move between provinces provided they go to a registered station in the receiving province. They may not be exported.

Countries exporting eggs to Canada must have a grading system equivalent to Canada's. Eggs must be graded, packed and marked according to Canadian requirements, and upon importation must be inspected before release for sale in Canada.

AMENDMENT TO THE EXPORT AND IMPORT PERMITS ACT

(Turkeys, Eggs and Egg Products)

The Export and Import Permits Act was amended, effective May 7, so as to provide enabling authority for the imposition of import controls to support the operation of national supply management programs authorized under the Farm Products Marketing Agencies Act.

Subsequently, turkeys, eggs and egg products were placed on the Import Control List effective midnight, May 8. This action was taken to support the national turkey and egg marketing programs which were being threatened by low-priced imports.

The government has determined that a threat to these programs exists when producer prices for eggs are at or below 60 cents a dozen, basis Grade A Large, Ontario, and when turkey prices are at or below the equivalent of 37.5 cents a pound liveweight, basis heavy toms (20 lb. and up) Ontario.

When Canadian prices are above these levels, imports will be freely permitted.

Should the price of poultry feed in Canada change either up or down, the above prices will be adjusted by a corresponding amount.

Monthly global import quotas have been established in relation to the previous five-year average import volume. Public notice of the size of the quotas will be published in the Canada Gazette.

Import permit controls are administered by the Export and Import Permits Division of the Department of Industry, Trade and Commerce under the authority of the Export and Import Permits Act.

(Canada Gazette and CDA News release)

EXPORT AND IMPORT PERMITS ACT

(Amendment to Section 3, Effective May 6, 1974)

The amended Section 3 contains, after paragraph (a), the following: "(a.1) To ensure that any action taken to promote the further processing in Canada of a natural resource that is produced in Canada is not rendered ineffective by reason of the unrestricted exportation of that natural resource." (This permits restriction of importation of articles that are products of Canadian natural resources, where national policy requires the further processing of that product in Canada.)

Subsection 5(1) of the Act includes this new paragraph: (a.1) "To restrict, for the purpose of supporting any action taken under the Farm Products and Marketing Agencies Act the importation in any form of a like article to one produced or marketed in Canada, the quantities of which are fixed or determined under that Act." (This amendment allows limitation of the import of any article that is limited under the FPMA Act in respect of production or marketing in Canada.)

The amendment also rescinds the expiry date of the Act - July 31, 1974.

FARM IMPROVEMENT LOANS ACT, SMALL BUSINESSES LOANS ACT, FISHERIES IMPROVEMENT LOANS ACT

(Amendment, April 16, 1974)

This amendment, as it affects Farm Improvement Loans, includes Alberta Treasury Branches among eligible lenders. It widens the scope of such loans by changing paragraphs (a) and (b) of Subsection 2(1) to include: "(a) purchasing of, major repair to or major overhaul of agricultural implements or equipment for beekeeping; and (b) the purchase of livestock or bee-stock."

Paragraph (c) of the same subsection now includes "the purchase or installation of, major repair to or major overhaul of, agricultural equipment or a farm electric system."

In addition the new regulations define the principal amount of a loan for joint borrowers, and defines the limitations on Ministerial liability under the Act in respect of loans made during specified periods.

FARM CREDIT ACT

(Farm Credit Regulations)

The amendment of February 26 affects Section 4, Subsection 8(2), Section 11 and Subsection 15(2) of the Farm Credit Regulations.

Section 4 as amended enables the Corporation to make a certain type of loan at its own discretion. The previous legislation had stated that the Corporation could not lend on security of land that a farmer had leased to another person. The changed wording states that the Corporation may decline to lend in these circumstances, allowing it to use its discretion in lending to a farmer who for a logical reason wishes to rent a part of his farm to someone else.

The new form of Subsection 8(2) removes the necessity to charge an appraisal fee on the balance of an original loan that is being re-financed by a new loan. For example: the old regulation meant that if a man who already owed the Corporation $30,000 on a loan received five or more years ago, applied for an additional $30,000, he would have paid an appraisal fee of $10 plus one-fifth of 1 percent on $60,000 (the total of his two loans).

The new regulation removes the five-year qualification. The applicant would now pay the $10 appraisal fee plus one-fifth of 1 percent on the additional funds. He pays on the new funds only, regardless of when he got his original loan.

Section 11 of the Regulations is revoked completely. This section had stated that for purposes of a Part 3 loan, livestock would be appraised at its market value or on the basis of its average value over ten years, and that farm equipment would be appraised at its value as used equipment. These terms were removed to allow appraisals to be made on a less restricted basis and to be more closely related to current values.

Subsection 15(2) now states that where the value of land does not provide enough security for repayment of a loan, additional security up to 50 percent of the amount required may be represented by the appraised value of livestock and farm equipment. Formerly, only 40 percent could be represented by these two items, and the share to be represented by equipment was limited to 25 percent.

AGRICULTURAL PRODUCTS MARKETING ACT

(Provincial Milk Marketing Levies)

British Columbia, Manitoba, Saskatchewan, Quebec, Ontario and Prince Edward Island, through their provincial milk marketing agencies, set new levies on milk producers. The producer selling or delivering milk to a plant now pays the provincial board 15 cents on each 100 pounds of milk (or $0.0429 on each pound of butterfat) within his quota. That is an increase of 50 percent from the previous 10-cent levy. For over-quota sales, the levy is $1.50 per hundred pounds of milk, or $0.4286 per pound of butterfat. In Ontario the over-quota levy on cream returns to its former level of 22 cents per pound of butterfat. (The earlier increase to 38 cents was an administrative measure to avoid payment of a special temporary subsidy on over-quota milk.)

HOG STABILIZATION PLAN

This interim plan under the Agricultural Stabilization Act was announced by Agriculture Minister Eugene Whelan on May 22. It guarantees hog producers a margin of $22.41 a hundredweight of pork between the wholesale cost of feed and hog prices. This figure is based on the five-year average of wholesale feed costs, up to April 1, 1974, and the national average pork price for the same period. The figure of $22.41 represents 90 percent of the average margin of hog prices over feed costs during the five-year period.

The plan covers all hogs slaughtered between April 1, 1974 and March 31, 1975. Payment of subsidies will begin on April 1, 1975. To ensure their eligibility under the plan, producers should retain proof of sale of their market hogs, such as grading certificates on carcasses. Producers participating in multiple-owner operations are eligible to submit individual claims.

The plan is operated by the Agricultural Stabilization Board.

FARM PRODUCTS MARKETING AGENCIES ACT

(Turkey Marketing Agency)

This agency was established on December 18, 1973, and proclaimed in effect February 20, 1974. Its aim is to assist orderly marketing for producers, to provide adequate high quality supplies to consumers at fair prices, and to help develop both domestic and export markets. The proclamation as printed in the Canada Gazette (March 13) sets out the organization of the agency, its marketing plan, quota system, licensing rules, levies on producers, anti-dumping regulations, etc.

CANADIAN WHEAT BOARD ACT

(Amendment to Wheat Board Regulations)

Dated March 1, 1974, an amendment of Subsection 25(1) established initial payment on wheat from the designated area (see below) at $3.75 per bushel, in store Thunder Bay or Vancouver, on the basis of the basic grade, No. 1 Canada Western Red Spring.

Subsection 25(3) of the Regulations set $2.25 per bushel as the initial payment on barley from the designated area, on the basis of Grade 2 Western Canada Six Row (formerly Grade 3) at Thunder Bay or Vancouver.

The "designated area" comprises Manitoba, Saskatchewan, Alberta, two points in the Peace River region (Peace River Division and Creston-Wynndel) and another point as decided by the Wheat Board.

PUBLICATIONS

ECONOMICS BRANCH PUBLICATIONS

Available from the Economics Communications Unit, Agriculture Canada, Ottawa, K1A 0C5

Prairie Regional Studies in Economic Geography No. 15, The Biggar Region of Saskatchewan. H.R. Fast, D.A. Neil. Regina, November, 1973. Tables, maps, photographs. 237p. Pub. No. 73/22. Free.

Working Paper on: Sheep Production in the Outaouais Region of Quebec. A Federal Employment Stimulation Project. Montreal, December 1973. Tables. 53p. Pub. No. 73/6. Free.

Aeris 1973: Agricultural Economics Research Information System, Report 4. Ottawa, December 1973. Bilingual. Tables. 31p. Pub. No. 73/24. Free.

Publications 1973. A List of Material Published in 1973. Ottawa, February 1974. Bilingual. 8p. Pub. No. 74/1. Free.

AGRICULTURE CANADA PUBLICATIONS

Available from the Information Division, Agriculture Canada, Ottawa, K1A 0C5

List of Publications, 1974:

Growing Soybeans, by R.I. Buzzell, L.S. Donovan, and J.E. Giesbrecht. Ottawa, 1972. Reprinted, 1974. 17p. Illus., tables. 23cm. Paper cover. (Publication 1487). Cat. No. A53-1487. Free.

Report of the Canadian Grain Commission, 1972. Ottawa, 1973. 48p. Tables, organization chart. 25cm. Paper cover. (Also French.) Contents - Grain, production, quality and disposition. - Documentation and elevator operations. Research, information and other services. Personnel administration. Cat. No. A91-1/1972. Free.

Managing a Small Poultry Flock. Ottawa, 1973. Reprinted, 1974. 13p. Illus. 23cm. Paper cover. (Publication 1489). Prepared by the British Columbia Department of Agriculture, Poultry Branch and published by the Canada Department of Agriculture. Cat. No. A63-1489. Free.

Agriculture Abroad. Bi-monthly digest of agricultural policies and programs in various countries. Issued by the International Liaison Service, Canada Department of Agriculture, in co-operation with the Trade Commissioner Service, Department of Industry, Trade and Commerce. Processed. 28cm. Paper cover. Vol. 29. No. 1, February, 1974. 58p. Cat. No. A77-3/29-1. Free.

Dairy Produce Market Report, weekly. Bilingual. Vol. 49, No. 14, April 6, 1974. Cat. No. A77-7/49-14. Free.

Dairy Produce Market Report, weekly. Bilingual. Vol. 49, No. 15, week ending April 13, 1974. Cat. No. A77-7/49-15. Free.

Dairy Produce Market Report,weekly. Bilingual. Vol. 49, No. 16, week ending April 20, 1974. Cat. No. A77-7/49-16. Free.

STATISTICS CANADA PUBLICATIONS

Available from the Publications Distribution Unit, Statistics Canada, Ottawa, K1A 0T7

Coarse Grains Review, Vol. 33, No. 2, February, 1974. Bilingual. Cat. No. CS22-001. $1.50 per copy, $4.20 per year.

Dairy Review, Vol. 35, No. 2, February, 1974. Bilingual. Cat. No. CS23-001. 40¢ per copy, $4 per year.

Selected Meat and Meat Preparations, Vol. 6, No. 2, February, 1974. Bilingual. Cat. No. CS32-020. 15¢ per copy, $1.50 per year.

Field Crop Reporting Series, 1974. Bilingual. No. 3 - Stocks of Canadian Grain at March 31, 1974. Published April 19, 1974. Cat. No. CS22-002. 30¢ per copy, $5.60 for series of 20 reports.

Dairy Factory Production, Vol. 43, No. 3, March, 1974. Bilingual. Cat. No. CS32-002. 15¢ per copy, $1.50 per year.

Production of Eggs and Poultry, Vol. 27, No. 2, February, 1974. Bilingual. Cat. No. CS23-003. 30¢ per copy, $3 per year.

Grain Milling Statistics, February, 1974. Bilingual. Cat. No. CS32-003. 30¢ per copy, $3 per year.

Fruit and Vegetable Preservation: Pack of Frozen Fruits and Vegetables as Reported up to the End of February, 1974, Vol. 3, No. 2, April, 1974. Bilingual. (Service Bulletin). Cat. No. CS32-023. $1.40 per year.

Oilseeds Review, Vol. 4, No. 3, March, 1974. Bilingual. Cat. No. CS22-006, $1.05 per copy, $4.20 per year.

Selected Dairy By-Products: Production and Inventory of Process Cheese, Vol. 3, No. 5, March, 1974. Bilingual. (Service Bulletin). Cat. No. CS32-024. $1.40 per year.

Farm Implement and Equipment Sales, Vol. 16, No. 2, January-February, 1974. Bilingual. Cat. No. CS63-009. $1.50 per year.

Stocks of Fruit and Vegetables, Vol. 38, No. 4, April, 1974. Bilingual. Cat. No. CS32-010. 30¢ per copy, $3 per year.

Fruit and Vegetable Crop Reports, 1974. No. 1 - Intentions to contract acreages of processing vegetable crops, 1974. Published May, 1974. Bilingual. Cat. No. CS22-003. $1 for the series.

PARLIAMENTARY PUBLICATIONS

Available from Information Canada, 171 Slater Street, Ottawa, K1A 0S9

Combines Investigation Act, R.S. 1970, c. C-23 amended by c. 10 (1st Supp.), c. 10 (2nd Supp.). Office consolidation. Ottawa, 1972. (Reprinted, 1974) 31p. 27cm. Paper cover. Bilingual. Cat. No. YX75-C-23-1970. 75¢ per copy.

Standing Committee on Agriculture, 2nd session, 29th parliament, 23 Elizabeth 2, 1974. Chairman: Mr. Ross Whicher. Bilingual.

Minutes of Proceedings and Evidence Respecting: Estimates 1974/75, Department of Agriculture, No. 6, Thursday, March 28, 1974. 60p. Cat. No. XC12-292/1-6. 65¢ per copy.

Minutes of Proceedings and Evidence Respecting: Estimates 1974/75, Canadian Dairy Commission. No. 7, Tuesday, April 2, 1974. 37p. Cat. No. XC12-292/1-7. 50¢ per copy.

Minutes of Proceedings and Evidence Respecting: Estimates 1974/75, Canadian Livestock Feed Board. No. 10, Tuesday, April 23, 1974. 31p. Cat. No. XC12-292/1-10. 35¢ per copy.

Standing Committee on Agriculture, 2nd session, 29th parliament, 23 Elizabeth 2, 1974. Chairman: The Hon. Hazen Argue. Annual submission of the Canadian Federation of Agriculture. No. 3, Tuesday, April 9, 1974. 14p. Cat. No. YC25-292/1-3. 20¢ per copy.

Further Study of Certain Agricultural Problems in Eastern Canada. No. 4, Wednesday, April 10, 1974. Cat. No. YC25-292/1-4. 35¢ per copy.

Annual Presentation of the National Farmers Union. No. 5, Tuesday, April 23, 1974. 52p. Cat. No. YC25-292/1-5. 50¢ per copy.

Bills of the House of Commons, 2nd session, 29th parliament, 23 Elizabeth 2, 1974. Bilingual. Cat. No. XB292.

C-29. An Act to Amend the Combines Investigation Act in relation to profiteering practices. First reading, April 29, 1974. (Minister of Consumer and Corporate Affairs). 15p. Cat. No. XB292-29/1. 25¢ per copy.

C-30. An Act to Amend the Canadian Wheat Board Act. First reading, April 29, 1974. (Minister responsible for the Canadian Wheat Board). 2p. Cat. No. XB292-30/1. 15¢ per copy.

C-33. Two-Price Wheat Act. (An Act to provide for payments in respect of wheat produced and sold in Canada for human consumption in Canada.) First reading, May 3, 1974. (Minister responsible for the

Canadian Wheat Board). 6p. Cat. No. XB292-33/1. 15¢ per copy.

EXTERNAL AFFAIRS

Available from the Information Division, External Affairs, Ottawa, K1A 0G2

Reference paper 121. U.N. Food and Agriculture Organization. Prepared by Frank Shefrin, Chairman. Canadian Interdepartmental FAO Committee). Ottawa. revised March, 1974. 8p. Cat. No. E52-1/121. Free.

OTHER PUBLICATIONS

A Study of Private Company Farms in Saskatchewan. December 1973. Elmgren, Brown and Minogue. 116p. Department of Agricultural Economics, U. of Saskatchewan, Saskatoon. Research Dept. No. 73/13.

Today's Taxes - Tomorrow's Agriculture. Effects of tax policy changes on the future of agriculture. 110p. Agricultural Economics Research Council of Canada, 55 Parkdale Ave., Ottawa K1Y 1E5. $3.00.

Methane Gas Production From Animal Wastes. Agriculture Canada in collaboration with the University of Manitoba. 10p. Tables, diagrams, metric equivalents.

Publications and Papers available from the Department of Agricultural Economics, University of Manitoba. Mimeo'd list. 18p.

Research and Publications, 1973. Department of Agricultural Economics, U. of Manitoba. 87p.

IN REPLY

Anne McLean-Bullen, a research fellow in agricultural marketing at Wye College, Ashford, England, (formerly of AERC in Ottawa), found the December article on "The Role of the Federal Government in Export Market Development" to be very useful. "A good introductory survey and relevant conclusions," she comments. "But if I were a prospective exporter I still would not know where to begin my enquiries or whom to ask. How about a follow-up article - a critical appraisal of some specific federal efforts in the export field, e.g. Canadian Wheat Board? Success? Failure? " These and other suggestions have been passed on to the author. The editors hope to print his response in the next issue.

Commenting on "Off-Farm Work by Operators of Canadian Census-Farms" (December), Dr. M.J. Troughton, Assistant Professor, Department of Geography, University of Western Ontario, writes that the article was useful "as a basic résumé of the dimensions of off-farm work". He adds: "It would be interesting to see Provincial and/or regional variations with respect to this criterion of farm family economic viability. As a general comment, the article indicates how significant information on off-farm work is in Canada, and reveals the poor judgment that underlay any decision to limit this item in the Census. We need much more detail as to type of work (skilled, unskilled, etc.) and its seasonal pattern." These comments have been sent to the author.

On "The Role of the Federal Government in Export Market Development," R.A. McGillivray, Farmer-Investments, Regina, writes that "most beneficial information is contained in the conclusion or summary." But he thinks the article is too much in essay form. Of another December article, "Off-Farm Work by Operators of Canadian Census-Farms," Mr. McGillivray says it is "in well set out, presentable form, comments short and to the point. Information can be gleaned and an opinion arrived at prior to the author's conclusion. Therefore it is possible for the reader to compare his opinion to that of the author."

Another comment on this latter article comes from B.K. Acton, an economist with the Department's Economics Branch in Vancouver. "This article is most valuable," he writes, "but I wish the analysis could be done and published on a provincial basis as well. Particularly in B.C., a published breakdown of this type would be most useful. Non-farm income in this province associated with part-time and full-time farming as related to size (dollar sales) is something that would be most useful." These suggestions have been passed on to the author.

Regarding the article on milk quotas in C.F.E. for October, R.N. Plank, Assistant Branch Manager, FCC, of Kelowna, B.C., felt it "covered a subject of direct interest and consequence to a lending agency" but would have liked examples of how quotas were calculated. The author's reply is that quotas were calculated on producers' prior performances.

IN REPLY TO AUTHORS AND EDITORS REGARDING JUNE 74
CANADIAN FARM ECONOMICS

I have read the following article(s):

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CANADIAN FARM ECONOMICS

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RICE- WORLD SITUATION AND OUTLOOK

J.S. Carmichael *

The increased world production of rice in 1973 and the prospect of bigger crops in 1974 indicates some relief of the extremely tight rice situation of the past year.

World exports this year could be about 1 million tons higher than the 6.4 million tons in 1973. However, this would still be less than the average for the previous 10 years. Continued high prices will likely prevent much stock building, even though prices could weaken somewhat from the high levels of recent months.

INTRODUCTION

Rice has been cultivated as a food grain for almost 5,000 years, originating in Southeast Asia, probably India. China, the world's largest rice producing and consuming nation was one of the first countries to adopt it. Rice culture spread throughout Malaysia in very early years and somewhat later into Indonesia and the Philippines, reaching Japan about 100 B.C. At the same time, cultivation moved westward toward the Middle East, to Africa and the Mediterranean. Rice cultivation in North America commenced successfully about 1685, from seeds obtained from Madagascar.

Rice has been the basic food during the development and expansion of the civilizations of Southwest Asia. At least half the world's population normally eat rice in some form and for many of these people rice forms 70 to 80 percent of their daily food. A pound of rice contains more than 1,600 calories.

All grains lose nutritive value in the milling process. Rice has more serious losses of vitamins and minerals from milling, washing and cooking than do most other cereals. Losses of nutrients can be reduced by undermilling, by improving cleanliness of rice as sold to make excessive washing unnecessary and by cooking without the use of excess water which has to be discarded.

There are probably more than 7,000 varieties of rice grown throughout the world, but main types are physically described as long, medium and short grained. Rice grain quality, in addition to appearance, has two other major aspects, cooking quality and nutritive value. Varieties with high amylose content, about 28 to 30 percent, cook dry and fluffy, while those with lower amylose content, 22 to 25 percent, exhibit softer and stickier texture when cooked. Some Asian nations, including the Philippines and Indonesia, Japan, Taiwan and South Korea, prefer the softer, stickier rice. Other Asian consumers, including the Indian sub-continent, prefer the high amylose types. Japan exclusively produces short grained, low amylose types, referred to as Japonica rice. Thailand is the only major producer growing all main types. Consumer preferences are very strong; in some markets consumers will buy other cereals if long grain rice is not available, or have been known to pay up to twice as much for long grain as short grain rice. High quality markets in Europe, Singapore, and elsewhere prefer long grain rice. Half the world's export markets thus do not benefit from Japanese surpluses.

Typically, rice is almost always eaten in boiled form without any processing other than milling. In Asia, rice is the central dish of a meal, although final methods of preparation vary. A loaf of bread made from wheat is not regarded as an alternative to a bowl of rice, but can be complementary. Rice is, therefore, a major source of protein in the diets of most Asian people although it is generally lower in protein than most bread wheats. In some cases, the protein percentage has been as low as 4

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percent, and the maximum is about 13 percent. Part of the research work of the International Rice Research Institute, which developed a number of new, high yielding rice varieties in the 1960's was a program to improve protein content. Top dressing of soil with nitrogen fertilizer tends to increase protein. Unfortunately, many high yielding hybrid crosses in the early attempts had low protein content. Rice protein is relatively high in lysine.

New varieties are spreading in many, but not all, areas in Asia. In some areas the increase in production has been very sharp, particularly where local governments augment the work of the Rice Research Institute with varietal research of their own.

Rice is grown in flooded fields where possible, since it is tolerant to water, so that weeds, intolerant to water, can be effectively controlled. Transplanting gives rice a start over weeds. In direct planting, rice and weeds cannot be distinguished. Rice is double-cropped and at times the Japanese have triple-cropped some rice fields.

With the adoption of higher yielding varieties the pay-off from good weed control rises sharply. Labor use in weed control has increased even while, at the same time, use of herbicides and mechanical weeders has also increased.

TABLE 1. SEASON AVERAGE FARM PRICES, RICE AND WHEAT

	Wheat		Rice (rough)
	bu.	cwt.	cwt.
1970-71	$1.33	$2.22	5.17
1971-72	$1.34	$2.23	5.34
1972-73	$1.76	$2.93	6.73
1973-74 (est.)	$3.90	$6.50	14.14
Mar. 15, 1974	$4.96	$8.27	17.30

PRODUCTION

World production of rice has increased at the rate of about 2 percent a year to an estimated record of 307 million metric tons for the production year starting August 1, 1972 (Figure 1, Table 2). This compares with the record world wheat crop for the same year estimated at 349 million tons. The trend in the last two decades has been for wheat production to increase faster than rice. Between 1948 and 1952, world wheat production was only 2 to 3 percent greater than rice; between 1952 and 1956 the spread had grown to $3^1/_2$ percent; in the last few years the spread has been well over 10 percent.

Figure 1

TABLE 2. PADDY RICE PRODUCTION 1964 TO 1973[a]

Country	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973[b]
					– Production (million metric tons) –					
Mainland China	85.0	87.0	82.2	86.4	88.6	92.5	97.5	98.0	98.0	103.0
India	58.6	46.0	45.7	56.4	59.7	60.6	63.7	64.0	58.0	65.5
Pakistan	17.8	17.7	16.4	19.0	20.1	21.3	20.0	3.1	3.5	2.9
Bangladesh								16.8	15.4	18.3
Japan	15.7	15.5	15.9	18.1	18.1	17.5	15.9	13.6	14.9	15.2
Indonesia	13.0	13.6	14.1	14.3	16.2	17.5	17.5	19.6	19.0	20.3
Thailand	11.1	10.8	13.5	11.2	11.2	13.4	13.3	13.4	11.8	13.5
Burma	8.2	8.1	6.6	7.7	8.0	8.0	8.1	7.8	7.4	8.6
Brazil	7.6	5.8	6.8	7.0	6.4	6.9	6.3	5.4	6.2	6.2
Philippines	4.0	4.1	4.1	4.4	4.4	5.2	5.3	5.1	4.4	5.8
United States	3.3	3.5	3.9	4.1	4.7	4.1	3.8	3.8	3.9	4.2
South Vietnam	5.2	4.8	4.3	4.7	4.4	5.1	5.7	6.3	5.3	5.5
South Korea	5.4	4.8	5.3	4.9	4.4	5.6	5.6	5.5	5.7	6.1
Total	235.0	222.0	219.0	238.0	246.0	251.0	263.0	262.4	253.5	275.1
World Total[c]	257.0	245.0	243.0	269.9	273.0	286.0	298.0	292.8	285.5	307.1

SOURCE: U.S. Department of Agriculture

[a]Year beginning August 1
[b]Preliminary
[c]Excludes North Korea and North Vietnam

Year to year fluctuations in rice production have not been as severe as those for wheat. However, rice production declined in 1971 and 1972 after several years of relatively uninterrupted increases. Two years of down-turn in production coupled with the one year's significant down-turn in wheat in 1972 precipitated the crisis in world food grain production in 1973. World rye production, which is less than 10 percent of rice production, has also been declining and in 1973 was down by 13 percent from the average production for 1967-71.

The bumper rice crop of 1973 can be attributed partly to slightly higher acreage, but largely to improved weather conditions in the main Asiatic producing countries. The poor crops of 1972 in India, Thailand and the Philippines particularly, had been due to a poor monsoon, while floods, disease, and military activity were also contributing factors in some areas.

ACREAGES

Acreages of rice and wheat have increased only marginally in recent years. For the period 1967-71 world acreage of rice at about 319 million acres compared with wheat at 529 million. In 1972 the acreages of both wheat and rice were lower than the 1967-71 average, but in 1973 both had recovered to slightly higher levels than the 1967-71 average, with rice at about 322 million acres and wheat at 537 million. In 1973 India had the largest acreage in rice of any country, at 91 million acres, with China second at 80 million.

The largest wheat acreage is in the U.S.S.R. where more than 150 million acres were planted in 1973. The second largest acreage was in China with about 62 million acres, followed by the United States with a harvested acreage of about 54 million, India with about 50 million and Canada with about 25 million.

YIELDS

Yields of rice (Table 3) increased in 1973 to 46.7 bushels compared to about 43.7, the average for 1967-71, and between 30 and 35 bushels in the 1950's. Main exceptions were the two principal exporting countries, the United States and Thailand. Thailand recovered partly in 1973 from the sharply reduced yields of the preceding year, while the United States yields were down from high yields of 1972. Of greater significance, however, is the wide spread which occurs among different countries with Japan the leader with about 115 bushels an acre in 1973 followed by South Korea with 102 and United States with 95. Most producing countries are far below these levels, the only other country listed with more than 50 bushels per acre being Mainland China with 63. India, the second largest producer, had yields in 1973 which averaged only 35 bushels, and Thailand, Burma and the Philippines were all in that range. Average rice yields of about 44 bushels

TABLE 3. YIELDS OF ROUGH RICE BY MAIN PRODUCING COUNTRIES

	Average 1967-71	1972	1973
	— bu. per acre —		
Mainland China	59.7	60.7	62.8
India	42.5	32.9	35.1
Pakistan	40.6	46.6	45.2
Bangladesh	33.9	31.1	36.5
Japan	106.9	111.6	114.8
Indonesia	42.2	44.8	50.2
Thailand	40.4	32.9	37.3
Burma	32.5	30.7	33.9
Brazil	23.4	25.2	24.2
Philippines	30.3	28.2	35.7
United States	100.3	104.3	95.0
South Vietnam	41.2	40.6	42.2
South Korea	85.3	95.2	102.5
World Total	43.8	44.0	46.8

SOURCE: World Agricultural Production and Trade, December 1973, U.S.D.A.

(45 lb.=1 bu.) an acre in recent years compared with wheat at about 24 bushels (60 lb.=1 bu.) an acre.

Until the 1960's rice production increases depended largely on increases in area rather than in yield. In the early 1960's the International Rice Research Institute undertook studies related to rice production including plant physiology, plant pathology, entomology, varietal improvement, chemistry, agronomy, soil chemistry and microbiology, as well as statistical, economics and agricultural engineering work. Various other agencies including government agencies have also been active in various activities to improve production. The first main results were new varieties which were developed, starting in 1966 and which were capable of much higher yields than before. However, the upward trend in yields after 1966 was not as significant as might have been expected. Diseases, fungi, blights and insects have been very difficult to cope with in the tropics no matter what varieties are planted, and when developing new varieties, resistance to these is always a major factor.

MAIN PRODUCING COUNTRIES

The major rice producing countries are in Asia (Table 2). China, with slightly less acreage but much better yields than India, is the world's foremost producer with an estimated 103 million tons in 1973, one third of the world's total. Chinese production in the past 10 years has increased by 20 percent and the rate of increase has been fairly steady. India is the second major producer with more than one fifth of the world's total. India's total production has increased during the past 10 years by about 12 percent, but has been marked by two serious periods of shortfalls because of drought, the first in 1965 and 1966 and the second in 1972. In 1972 the monsoon rains were inadequate, but in 1973 the weather was much better and production was up by 12 percent to a record level.

Pakistan and Bangladesh have had production difficulties, particularly in the last few years, with war and flood problems. While Pakistan still had flood problems in 1973, Bangladesh had an excellent crop, about 5 million tons more than in 1972.

Japan is the only major producer with less production in the last two years than it had in 1964. This initially resulted from encouragement by the government to intensify production in the 1960's. Government subsidies at $395 a ton were paid for brown rice. When consumption fell off in the 1960's, surpluses developed and programs were devised to reduce production and dispose of surplus rice. The target set was for a production level in 1977 which was 29 percent lower than in 1969. For 1974, the Japanese wish to remove 850,000 acres from production and are offering $535 an acre to convert to other crops. The problem still remains that even with the large inducement the potential returns from rice will still be higher than can be expected from any other crop.

The other two producers of more than 10 million tons a year are Indonesia and Thailand. Indonesian production has had the fastest growth rate among the main producers, with 1973 production at a record level. Thailand's increase has been slight and production was sharply down in 1972. Burma, the Philippines and South Vietnam also had poor years in 1972 but increases in 1973.

Brazil, with 2 percent of the world's production, and the United States with less than $1^1/_2$ percent, are the two main non-Asian rice producers. Brazil has not increased production in recent years. There is a small but growing industry in Australia. In 1973, the United States had a 9-percent production increase, although yields were lower than the previous year. Production was quite evenly divided between Arkansas, California, Texas and Louisiana.

UTILIZATION TRENDS

The immediate post-war period was marked, particularly in developing countries, by a heavy increase in domestic utilization of the main staple, whether it was rice in the Far East, wheat in Iraq, Turkey and Algeria, millets and cassava in tropical Africa or corn in Mexico. During this

TABLE 4. PER CAPITA WORLD WHEAT AND RICE DOMESTIC DISAPPEARANCE*

Grain and Year	United States	Canada	EC-9	Japan	Australia and New Zealand	USSR	China	Brazil	Central Africa	West Asia	South Asia	South-East Asia	East Asia & Pac.	World Total
						— kilograms per person —								
Disappearance														
Wheat														
1964-66	99	218	151	49	207	345	39	33	5	173	38	1	9	83
1969-71	105	225	161	51	183	362	33	40	6	187	42	1	16	85
1971-72	111	232	159	50	224	393	32	39	6	176	42	2	16	87
1972-73	102	219	169	52	220	398	36	36	6	186	51	2	16	89
1973-74	96	208	160	53	199	421	38	42	6	180	52	2	17	91
Milled rice														
1964-66	5	2	3	121	3	3	75	53	14	13	73	160	93	49
1969-71	6	2	3	114	2	5	77	52	15	16	81	190	108	54
1971-72	6	2	3	118	3	5	79	53	16	16	79	177	109	54
1972-73	6	3	3	111	3	6	75	55	16	16	78	166	112	53
1973-74	6	2	3	98	3	6	77	54	16	17	80	176	116	54

SOURCE: World Agricultural News, U.S.D.A.

*Disappearance equals production and net trade and change in stocks (where data on stocks are available).

period there was a shift toward rice in Japan, Ceylon, the Philippines and Malaysia at the expense of barley, wheat, corn, and root crops. In India, rice and wheat both became more important. In Korea, Hong Kong, Taiwan and Bangladesh wheat increased in importance. In the Near Eastern countries, particularly Turkey and Iraq, the trend was toward wheat and away from corn or barley. The general trend in utilization of basic staples in the post-war period for many countries has been to shift away from cassava and coarse grains such as barley and corn in favor of increases in rice and wheat.

During the past 10 years, there has been an increase in the per capita utilization of both wheat and rice. However, this seems to be changing, because while there has been a steady increase in the last four years in per capita wheat disappearance of more than 2 percent, the disappearance of rice on per capita basis has remained steady.

Disappearance of rice compared with wheat during the past 10 years in terms of kilograms per person is shown in Table 4. This table indicates clearly the wide disparity which exists in various parts of the world in consumption habits between the two grains.

The western developed countries such as the United States, Canada, the E.E.C., as well as Australia, use rice only in extremely small quantities compared with the use of wheat. In the United States, the proportion is roughly 6 pounds of rice to 100 of wheat, in the E.E.C. about 2 pounds to 100, in Australia about 1.5 to 100 and in Canada only about 1 pound of rice to 100 pounds of wheat. In Southeast Asia, the ratio is almost the reverse to that in Canada with no sign of any change in trend. In East Asia and the Pacific Islands area including Indonesia, the trend is toward sharply increasing rice usage and a very slow increase in wheat usage. In South Asia, including India, rice is still predominant but wheat usage has been growing more sharply, and the same situation is generally true in China. West Asia, on the other hand, is a much heavier user of wheat rather than rice although there has been little change in trend in recent years. In Japan, the use of wheat has been increasing, accompanied by a drop in rice utilization. North Africa is predominantly a wheat consuming area while in Central Africa, rice is dominant, although total disappearance of both is low. The U.S.S.R. utilizes rice at a rate only slightly higher relative to wheat than does Canada. While in the United States and Canada per capita utilization of wheat is declining, that of the U.S.S.R. has climbed sharply in the past few years and its per capita utilization is twice that of any other developed nation. In Brazil, an earlier post-war trend toward rice has been reversed in the last few years with an increasing utilization of wheat.

In countries such as Burma, Taiwan, Malaysia and Thailand, utilization of rice is from 270 to 290 pounds a year. While some Asian countries are moving in some degree to the greater use of wheat, some are not changing and in some areas rice utilization is advancing relative to wheat.

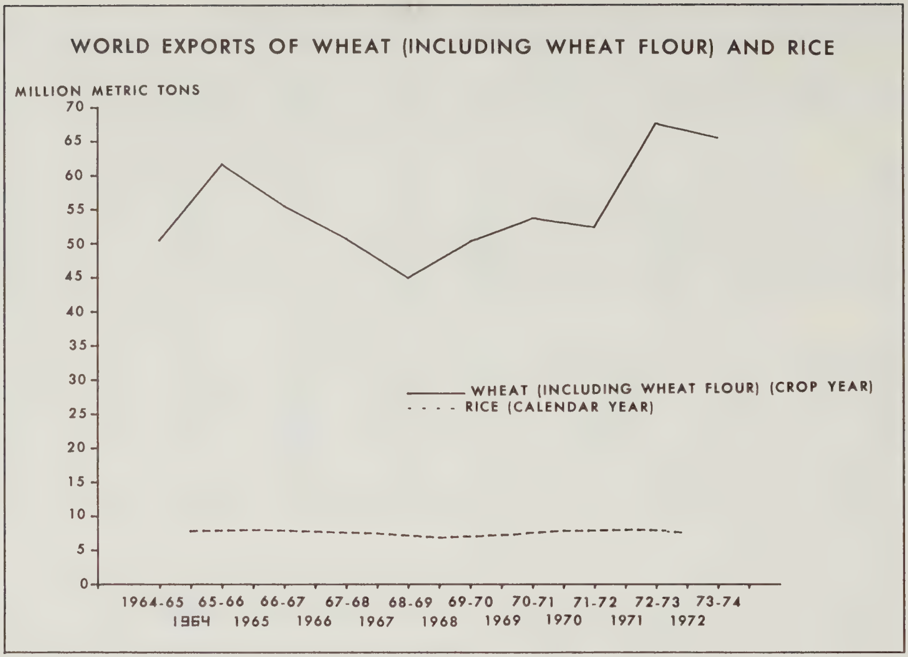

Figure 2

WORLD TRADE

Despite the fact that world production of rice is not far short of wheat production, world trade in milled rice in recent years is only about one eighth of world trade in wheat (Figure 2) and was even less in 1973, with an estimated rice trade at 6.4 million tons compared with wheat for 1973-74 at 63 million tons. The record high rice trade was 9.5 million tons, reached in 1934.

After the second world war, a complete reversal occurred in trade patterns. The disruptive effect of the war was much greater in rice and coarse grains than in wheat. Some factors involved in the relative expansion of wheat trade in the post-war period were the special shipments in the rehabilitation period, the expansion of surplus disposal and aid programs, and more recently, the massive purchases by the U.S.S.R. and the People's Republic of China. National protective measures have been more effective in the case of wheat than with rice. Technical progress in seeds, machinery, fertilizer and various techniques favored wheat for many years. Rice trade, on the other hand, lost ground in the post-war period, and decreased to about one half or less of its pre-war level. While world trade in the past decade has climbed somewhat above the immediate post-war level, it has not matched absolutely or relatively the increase in trade in wheat. Rice trade has not fluctuated from year to year as markedly as wheat.

Since the early 1960's, world exports of rice has on two occasions, 1965 and 1971, exceeded 8 million tons (Figure 2). Final figures for 1973 are not available but estimates indicate a total trade of only about 6.4 million tons. The trading structure has changed substantially in post-war years with Asian countries handling only 60 to 70 percent of exports compared with 95 percent in earlier years. Non-Asian trading nations include the United States, Egypt and Italy.

The main exporting countries in recent years have been Thailand and the United States, with Thailand the major exporter in 1971 and 1972 (Table 5). Exports from Thailand are estimated to have fallen quite substantially in 1973 following a poor crop late in the previous year. Exports from Thailand in 1973 are estimated at only 950,000 tons, which is less than half of 1971 exports. Thailand banned exports completely for several months starting in June, 1973. Burma's exports are estimated to have fallen from 460,000 tons in 1972 to 100,000 in 1973.

TABLE 5. EXPORTS OF MILLED RICE FROM SPECIFIED COUNTRIES, 1963 TO 1972

	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	% of world total
	'000 M.T.										
Exports											
Africa (total)	419.1	572.4	352.7	382.5	493.2	657.9	846.2	739.3	568.7	508.1	6.7
North and Central America (total)	1,201.9	1,333.0	1,558.4	1,363.5	1,864.9	1,974.3	1,943.5	1,765.9	1,489.5	2,057.3	27.2
U.S.A.	1,197.2	1,329.1	1,549.4	1,352.3	1,848.0	1,897.9	1,918.0	1,740.4	1,477.5	2,035.8	26.9
South America (total)	153.6	144.6	435.0	593.3	307.0	397.0	339.3	386.2	423.2	209.6	2.8
Asia (total)	5,328.1	5,512.0	5,430.0	5,204.9	4,346.6	3,325.8	3,701.2	4,423.2	4,912.3	4,064.3	53.8
Thailand	1,417.7	1,896.3	1,895.2	1,507.6	1,482.3	1,077.9	1,023.1	1,063.6	1,576.1	2,076.0	27.5
China	759.1	912.0	1,009.9	1,393.4	1,265.6	952.8	884.5	967.9	938.3	750.0	9.9
Burma	1,712.0	1,413.0	1,335.0	1,127.6	540.0	351.7	540.8	640.1	810.5	460.0	6.1
Pakistan	365.0	256.1	197.6	429.4	360.2	253.8	312.7	482.0	177.0	300.0	4.0
Japan	0.2	0.1	0.3	0.01	0.2	0.4	361.4	597.2	912.1	202.0	2.7
Europe (total)	246.4	232.1	266.4	225.2	361.3	418.0	326.0	508.3	558.3	521.0	6.9
Italy	147.3	67.6	103.2	75.8	153.3	184.2	175.4	344.9	435.5	363.4	4.8
U.S.S.R.	12.0	4.4	3.1	4.3	4.0	4.3	4.8	7.7	14.4	15.0	0.2
Oceania	58.0	56.8	64.8	64.4	89.6	101.9	111.2	128.8	102.4	178.6	2.4
World Total	7,420.1	7,856.5	8,112.4	7,840.1	7,466.7	6,879.4	7,272.4	7,959.4	8,069.5	7,554.0	100.0

SOURCE: F.A.O. Trade Year Book, Volume 26, 1972

Imports of rice (Table 6) have been greatest into Asian countries such as Bangladesh, Indonesia, Korea, Philippines, India and Hong Kong. Most are major producers, but not in sufficient quantities to cover domestic needs. Outside of Asia, which normally imports at least two thirds of the world's total, Europe and Africa normally account for the remainder of world imports. Canada's imports are usually less than 1 percent of total world imports.

Importing countries had normal importing patterns badly disrupted in 1973. In Hong Kong, a major

TABLE 6. IMPORTS OF MILLED RICE BY SPECIFIC COUNTRIES, 1963 TO 1972

	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	% of world total
	'000 M.T.										
Imports											
Africa (total)	594.6	693.9	817.9	812.9	723.3	702.5	700.5	834.4	922.6	909.2	11.1
North and Central America (total)	367.0	462.6	533.5	345.2	333.9	370.4	344.6	420.2	575.1	485.6	5.9
Canada	34.7	34.7	54.5	38.8	40.8	43.2	42.5	48.5	67.4	62.6	0.8
South America (total)	15.5	72.9	112.3	125.5	73.5	70.7	93.0	39.5	46.4	97.2	1.2
Asia (total)	4,982.4	5,187.7	5,294.3	5,200.8	5,065.3	4,729.7	4,349.2	5,485.4	4,992.6	5,377.4	65.4
Bangladesh	418.7	283.2	81.9	330.1	371.7	283.0	239.8	510.0	347.5	658.0	8.0
Indonesia	1,075.3	1,024.5	193.0	306.0	346.6	707.1	604.6	956.1	494.0	734.3	8.9
Korea	117.2	0.02	0.02	11.8	139.0	246.8	631.3	769.5	1,007.4	731.9	8.9
Philippines	256.0	298.9	559.6	108.2	290.5	0.01	0.01	–	436.8	433.8	5.3
India	620.2	720.0	1,012.7	971.4	743.1	757.8	782.5	582.8	539.6	419.0	5.1
Hong-Kong	411.9	411.1	370.3	366.6	420.8	314.0	347.0	344.5	370.6	414.6	5.0
Europe (total excluding U.S.S.R.)	881.5	851.6	878.9	1,035.5	829.2	958.5	950.6	858.8	974.0	988.0	12.0
U.S.S.R.	193.6	363.1	237.9	275.4	397.3	260.0	326.5	322.9	332.4	279.8	3.4
World Total	7,084.4	7,686.3	7,938.7	7,880.7	7,493.4	7,168.6	6,838.5	8,041.5	7,927.8	8,224.7	100.0

SOURCE: F.A.O. Trade Year Book, Volume 26, 1972

customer for Thai rice, importers had to turn to the U.S. The Philippines were able to import only part of their requirements and had to use as a substitute a mixture of corn and rice.

WORLD PRICES

For a long period prior to World War II, prices of wheat flour on world markets were higher than rice prices; at the turn of the century, flour in Britain was about 65 percent above rice, and wheat sold at 10 percent above rice. However, during this time the price difference was steadily decreasing. The changeover came during the war period and since 1947, wheat and wheat flour have been considerably cheaper on world markets than rice.

In post-war years the disparity between wheat and rice prices has continued to grow. In the early 1960's, export prices for top quality Thailand rice, which in recent years has become the reference point in world rice pricing, were largely in the range of $125 to $160 a metric ton while wheat prices on world markets throughout this period ranged largely between $60 and $70 a metric ton (Canada No. 1 Northern in store Thunder Bay). Prices of export rice and wheat in recent years are shown in Figure 3. In the 1960's, there was one period following the severe drought in India in 1965 when a rice shortage occurred. Rice export prices at Bangkok rose very sharply to about $240 per metric ton in 1968. There was no wheat shortage and the rice shortage and high prices had little or no effect on wheat prices. Rice export prices fell back to a range of $115 to $130 in 1971. In general, rice export prices have fluctuated more than wheat prices.

In 1973 there was a marked similarity between rising wheat and rice prices with shortages in both grains simultaneously. The particular shortfall in Thailand led to a discontinuance of pricing at Bangkok after the first week in March 1973, although some estimates were made for summer months at $330 a metric ton. In February 1974, rice prices f.o.b. Bangkok were triple the level of January 1973 at $575 a metric ton, while wheat prices for No. 1 Northern were at $217.

While meaningful international price comparisons have been difficult to make for some months, domestic United States prices to farmers indicate price trends and relationships between the two food grains.

Rice gross returns to farmers at March 15, 1974 were still more than double the wheat returns. In the milling

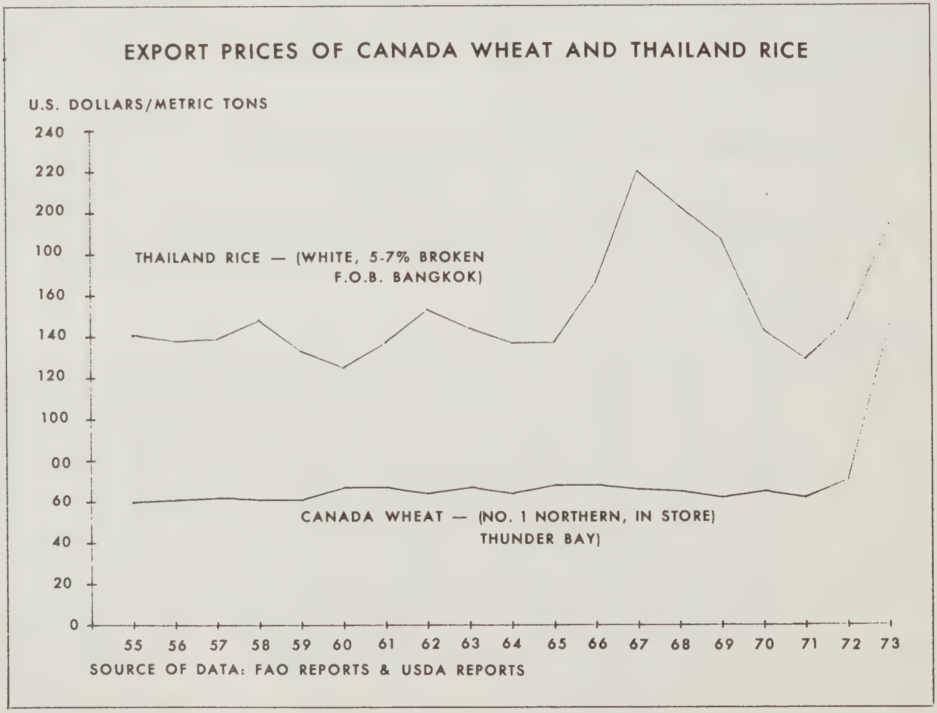

Figure 3

TABLE 7. CANADIAN IMPORTS OF RICE AND RICE PRODUCTS

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
					'000 cwt.					
Rice cleaned	317.2	696.1	361.3	288.5	354.8	305.5	487.7	901.7	660.0	756.8
Rice uncleaned, unhulled or paddy	687.7	776.2	760.2	941.5	917.9	969.9	894.2	900.2	1,107.3	965.4
Rice starch or flour	15.3	8.5	9.5	7.1	9.8	9.8	8.2	9.7	8.7	17.6

SOURCE: Imports, Trade of Canada, Statistics Canada

process rice losses run at 30 to 35 percent in weight, a very similar percentage to that lost when wheat is milled. For milled rice, long grained rice on a wholesale basis has commanded a premium in the U.S. of nearly $1.00 per hundred pounds, and at a retail basis, about 4 cents a pound.

CANADIAN IMPORTS AND UTILIZATION

Canadian imports of rice (Table 7) have increased (over the last 10 years) by about 70 percent. Imports of uncleaned rice in the last two years have averaged over 1 million cwt., although they have not changed substantially since 1967. On the other hand, in the last three years there has been a marked increase in the imports of cleaned rice, which in 1973 were more than 750 thousand cwt. A small amount of rice starch and rice flour, (amounting to some 17.6 thousand cwt. in 1973), is also imported into Canada.

The main exporter of uncleaned rice to Canada is the United States, which supplied practically all Canadian imports in 1973. The United States has provided well over 50 percent of Canadian requirements of cleaned rice in the past two years, and Mexico supplied a further 30 to 40 percent. In 1971, a large purchase was made from Italy and in 1965, a large purchase from Brazil. Rice starch largely comes from the United States, recently amounting to well over half of Canadian imports. Much of the remainder in 1973 came from Hong Kong. Value of imports in 1973 were: cleaned rice, $11.8 million, uncleaned rice, $10.3 million, and rice starch, $164 thousand.

Apart from the use of rice as food in Canada, the brewing industry utilizes limited quantities of rice, rice flakes and grits. The amounts used are declining while the use of corn, corn flakes and grits in the industry is expanding. In 1960, the industry used 15 million pounds of rice compared with 28 million pounds of corn. In 1970, the industry used only 3.5 million pounds of rice products valued at $260 thousand compared to about 96 million of corn valued at $5 million.

OUTLOOK FOR RICE

The increased world production of rice in 1973 and the prospect of bigger crops in 1974 indicates some relief of the extremely tight rice situation of the past year. Countries such as Burma and Thailand, whose combined exports normally constitute one third of world exports but whose ability to export last year was curtailed, could be back to normal if no further monsoon failures occur. United States farmers indicated in March intentions to plant 2.4 million acres; at normal yields this could return a record 111 million cwt., and record supplies of 116 million cwt. In spite of the 4 to 5 percent increase in domestic use, there should be more rice available for export than last year. In Japan, where 1.4 million acres was taken out of production and 660 thousand acres kept idle, there is expected to be some danger in 1974 of overproduction with less incentive for straight idling of land, in spite of incentives to plant other crops. However, with their very heavy support policy, the Japanese do not wish to grow more than they consume as their prices to farmers are above world market prices; thus, they could not make export sales without an export subsidy program.

Some Asiatic countries including Indonesia and the Philippines, could be short of rice before the next crops are available. Many countries would wish to build and consolidate in 1974, but this may not be possible. Rice production is particularly hazardous since none of the producing countries (apart from the United States) produces any great quantity over its own domestic consumption. Thus, a poor crop in many sizeable areas can have wide repercussions throughout the rice consuming world.

World exports in 1974 at 7.3 million tons could be about 1 million tons higher than the 6.4 million tons in

1973. However, this would still be below the average for the previous 10 years. Continued high prices are likely to prevent much stock building, even though prices could weaken somewhat from the extremely high levels of recent months.

Many uncertainties surround the longer run situation. In the past decade, new varieties, together with additional inputs and better farm practices, have played an important role in yield improvements. These improvements have been substantial, although it was widely assumed that the impact of the green revolution would be even more dramatic. However, the improvements have disclosed a number of problems which must be met to ensure the increased growth of rice production which is so essential to feed the fast growing population of Asia. There is need for research in marketing and marketing problems, including drying, milling and in the problem of storage losses. There is need for improved production estimates and better grading standards. In production also, there is a requirement for study of improvements that could be made in irrigation practices, additional mechanization, multiple cropping and labor saving technology. There is need for study of action which could be helpful in landlord-tenant reforms, equity in treatment of big and small farmers and provisions of credit. Consumer research also would be helpful to promote greater use of short grain rice, to provide general consumer education and promote greater willingness to experiment.

Many countries have set themselves goals of self-sufficiency over the next few years. The assessment by some who have appraised the situation is that this should be possible. If this occurs, world exports as a percentage of production should fall. However, the success in any year will continue to relate to weather. A steady increase in productivity is necessary to feed the increasing population, and shortfall in any given year could bring a repetition of the recent supply problem. There appears to be no particular trend to greater use of wheat in many of the traditional rice countries outside of Japan. Rice as a convenience food may now be in closer competition with the potato than with wheat. Rice seems certain to remain the staple food of increasing millions of people for many years to come.

ECONOMICS OF FORAGE PRODUCTION AND USE ON GRAIN-CATTLE FARMS

The beef cattle population in the Arid Plains area of Southern Alberta and Saskatchewan swings significantly with the volume of grass available there and with the costs and returns involved. The careful management of forage crops is therefore a prime concern.

*J.K. Wiens**

INTRODUCTION

Market prices of grain and beef cattle greatly influence the amount of forage (mixtures of recommended grasses and legumes) grown by farmers and ranchers in the 50 million or more arid to semi-arid plains area of Southern Alberta and Saskatchewan. The economics of growing and using forage crops changes among these farms and ranches because of climate, soils and profits, but farm income from forage crops used in beef enterprises shows certain basic similarities. Most beef cattle graze on improved or native pasture land which will not produce a good grain crop. Farmers grow their winter feed for beef on higher quality land, alternately suited for crops of grain. These facts and their interrelationship with beef-grain enterprises are explored.

There was, for example, a significant increase in cattle numbers (14 percent) between 1966 and 1971, but during this period the grazing acreage declined. Unimproved pasture acreage declined by 1.5 percent during this time, improved pasture declined by 5.0 percent and seeded hay and fodder pasture increased by 30 percent. The number of cattle that this grazing area can carry can be changed by adjusting the grazing season, i.e., delaying spring grazing. The use of other management practices can also help to increase the carrying capacity of the pasture land.

GRASS ASSOCIATIONS AND SOIL ZONES IN THE AREA

The five grass associations found in the prairies are shortgrass, mixed, true, tallgrass and fescue prairie[1]. The shortgrass prairie association occurs in Southeastern Alberta and Southwestern Saskatchewan. This most arid part of the prairie region, in the Brown Soil Zone, has an extremely low average annual precipitation of less than 14 inches and a precipitation-evaporation ratio of less than 0.5:1.0. This is due to high average velocity winds, and a high mean annual temperature of over 38 degrees Fahrenheit.

The mixed prairie association lies in a crescent north of the shortgrass prairie. There, the mean annual precipitation ranges from 14 to 18 inches, and the precipitation-evaporation ratio runs from 0.4:1.0 to 1.0:1.0. The mixed prairie association is found in the Brown, Dark Brown and Black Soil Zones.

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[1] Lodge, R.W., "Dryland Pastures in the Grassland Zone of the Prairie Provinces". *Proceedings of the Canadian Forage Crops Symposium, 1969.* Modern Press, Saskatoon, Sask.

LAND CLASSES

There are two broad land classes in the Brown and Dark Brown Soil Zones: arable and non-arable. The arable land produces mostly annual crops. The non-arable land is mainly pasture as it includes those areas in land use classes 2, 3, 4 and 5 that have a limited potential for annual crop production due to soil type, texture, topography, stoniness or salinity[2]. Native grass pasture covers 36 percent of the Brown Soil Zone in Saskatchewan and 60 percent in Alberta; in the Dark Brown Soil Zone, it occupies about 21 percent of the land area in Saskatchewan and 25 percent in Alberta.

Around this grassland crescent there are two distinct areas: the southern parklands with the discontinuous forest of the Black and Grey Black Soil Zones, and the northern continuous Boreal forest of the Grey Wooded Soil Zone[3]. Twenty-six million acres are cultivated in the Black and Grey Black Soil Zones, which have an annual precipitation varying from 16 to more than 20 inches and which produce some of the highest yields of wheat and forage in Western Canada. Although the Grey Wooded Soil Zone is a major part of the area, only 13 million acres of it are cultivated. The annual precipitation there is from 12 to 13 inches. The climatic-soil conditions that limit cereal production in the Grey Wooded Soil Zone do not appreciably reduce the yield per acre of forage crops for hay and pasture.

Census divisions do not coincide with soil boundaries; therefore, only estimates of the area's extent and its land use can be made by using data summarized by census divisions. The Brown Soil Zone has about 33 million acres of farmland; 46 percent is unimproved and mainly used as native pasture. Some 19 million acres of farmland lie in the Dark Brown Soil Zone, and 22 percent of that acreage is not improved.

DESCRIPTION OF THE FARM-BEEF ENTERPRISE

Feed Requirements

Feed is the major input for the farm-beef enterprise and the feed requirements for beef cattle in this area fall into summer, fall, winter and spring periods. The summer period is distinct from the other periods, particularly where a community pasture is used. The other most costly and usually the longest feeding periods are not as clearcut. Winter feeding, the period when cattle can no longer forage because of weather conditions, usually starts at a different time each year, and can also be interrupted by a period of mild weather. In addition, some grain feeding can be started early if cattle have difficulty finding sufficient forage.

Method of Obtaining Data

In a mail survey of patrons of community pastures in 1971, data was obtained on some characteristics of the four feeding periods. To get a cross section of different farming areas, the following pastures were selected: the Battle Creek Pasture in Southwestern Saskatchewan, a cattle-grain area with emphasis on cattle; the Oakdale Pasture in West-Central Saskatchewan, a grain-cattle area with emphasis on grain; the Lomond No. 3 Pasture in Southeastern Saskatchewan, a cattle-grain area; and the Foam Lake Pasture in Central Saskatchewan. The first pasture lies in the Brown Soil Zone, the next two are in the Dark Brown Soil Zone, and the last one lies just outside the Dark Brown Soil Zone.

Results of Data

The spring grazing period averaged 1.1 month in the Battle Creek and Lomond No. 3 areas, ranging from .5 to 1.5 month; and .7 of a month in the other two areas, ranging from 0 to 1.0 month. The fall grazing period averaged 1.0 month in the Foam Lake area and 2.0 months in the Battle Creek area where the range was from 1.0 to 3.0 months (Table 2). Tables 3, 4 and 5 summarize the sources of fall, winter and spring feed requirements.

Fifty-six percent of the land used for fall grazing by patrons of the Battle Creek Pasture was "idle" cultivated land or "waste" land. The comparable percentage for each of the other areas was much higher. The rest of the acreage was chiefly native pasture. The percentage of farmers supplementing their grazing with harvested feeds (grain, pellets or hay) ranged from 18 percent in Lomond No. 3 to 52 percent in the Foam Lake area.

More than 40 percent of the land used for spring grazing in each area was "idle" cultivated land or "waste" land, and about 13 percent was seeded pasture. Forty-one percent of the spring grazing pasture was native pasture in the Battle Creek area, while the comparable figure for the Foam Lake area was only 11 percent. The farmers using harvested feeds ranged from 50 percent in the Oakdale area to 85 percent in the Foam Lake area. In these two localities, approximately 25 percent did not graze cattle in the spring period.

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[2] Clayton, J.S., Acton, C.J., Shields, J.A. and Rostad, H.P.W., 1966 Guide to Soil Capability in Saskatchewan. Publication M2, Saskatchewan Institute of Pedology.

[3] Elliott, C.R., "Dryland Pastures in Northwestern Canada", *Proceedings of the Canadian Forage Crops Symposium, 1969*, Modern Press, Saskatoon, Sask.

TABLE 1. LAND USE SUMMARY AND ESTIMATED LIVESTOCK NUMBERS FOR BROWN AND DARK BROWN SOIL ZONES, 1966 AND 1971.

Year		Saskatchewan		Alberta	
		Brown Soil Zone Census Div. 3,4, 7 & 8	Dark Brown Soil Zone Census Div. 2,6,11 & 12	Brown Soil Zone Census Div. 1, 2 & 4	Dark Brown Soil Zone Census Div. 5
1966	Number of Farm Units	16,376	19,178	8,540	3,860
	Improved Acres	12,167,371	11,941,922	5,327,915	2,961,410
	Pasture	600,442	397,225	408,240	148,965
	Hay and Fodder	353,758	262,564	386,492	96,065
	Unimproved Acres		3,233,051	8,192,501	999,368
	Total Cattle	626,807	461,016	677,138	201,599
	Total Sheep	43,837	18,415	87,073	10,444
	Total Horses	16,892	14,959	15,093	5,019
1971	Number of Farm Units	14,884	17,492	7,699	3,581
	Improved Acres	12,098,951	11,937,533	5,380,308	2,958,217
	Pasture	544,325	349,685	433,211	146,543
	Hay and Fodder	467,217	394,527	443,259	128,836
	Unimproved Acres	6,912,445	3,154,305	8,245,415	972,128
	Total Cattle	697,618	508,712	795,736	234,573
	Total Sheep	50,628	30,869	50,262	10,521
	Total Horses	15,228	13,744	14,699	4,837

SOURCE: Census of Canada, 1966, 1971.

TABLE 2. LENGTH OF BEEF CATTLE FEEDING PERIOD FOR PATRONS OF FOUR COMMUNITY PASTURES, 1971

Pasture	Fall Grazing	Winter Feeding	Spring Grazing	Summer Pasture	Total
			— months —		
Battle Creek	2.0	3.9	1.1	5.0	12
Oakdale	1.6	4.8	.7	4.9	12
Lomond No. 3	1.9	4.5	1.1	4.5	12
Foam Lake	1.0	5.7	.7	4.6	12

SOURCE: Survey of community pasture patrons, 1971.

This data shows the importance of open grazing for both fall and spring feed requirements. Although open grazing is largely a free resource, many farmers indicated that it was not fully utilized. The main factor limiting the size of their cattle enterprises was summer grazing.

Summer grazing from this unimproved pasture becomes a residual value to the farmer. Two important factors in determining its value are the price of the feeder animal produced and the cost of winter feed. A budgeted return for the 1965-72 period is shown in Table 6. The cost and return data for the 1971 budget was based on farm

TABLE 3. SOURCE OF FALL FEED REQUIREMENTS FOR BEEF CATTLE ENTERPRISES, BROWN AND DARK BROWN SOIL ZONES

Pasture	Cultivated Land or Open Grazing	Native Pasture	Seeded Pasture	Hayland	Percent of Farmers Feeding Grain, Pellets, or Hay
			— percent of total acres used —		
Battle Creek	56	42	2	—	24
Oakdale	89	10	—	1	31
Lomond No. 3	85	8	2	5	18
Foam Lake	72	21	3	4	52

SOURCE: Survey of community pasture patrons, 1971.

survey information. Cost data for the budgets of other years was adjusted by:

(1) using price indices for 1971 non-feed expenses;

(2) costing 1971 feed inputs at the market value for the particular year; and

(3) valuating 1971 production at the market value for the particular year.

This return will be somewhat lower for the Park area, which has a longer winter feeding period.

TABLE 4. SOURCE OF WINTER FEED REQUIREMENTS FOR BEEF CATTLE ENTERPRISE, BROWN AND DARK BROWN SOIL ZONES

Pasture	Cereal Hay	Tame Hay	Native Hay	Straw	Percent of Farmers Feeding Grain	Percent of Farmers Feeding Pellets
	– % of all hay –					
Battle Creek	52	46	2	100	94	29
Oakdale[1]	23	21	50	94	100	6
Lomond No. 3	14	50	36	93	78	13
Foam Lake	31	33	36	93	93	4

[1] Does not add to 100 percent since one farmer fed only straw.

SOURCE: Survey of community pasture patrons, 1971.

TABLE 5. SOURCE OF SPRING FEED REQUIREMENTS FOR BEEF CATTLE ENTERPRISE, BROWN AND DARK BROWN SOIL ZONES

Pasture	Cultivated Land and Open Grazing	Native Pasture	Seeded Pasture	Percent of Farmers Feeding Grain, Hay or Pellets
	– % of total acres used –			
Battle Creek	42	41	17	76
Oakdale	44	14	17	50
Lomond No. 3	71	14	9	59
Foam Lake	55	11	7	85

SOURCE: Survey of community pasture patrons, 1971.

TABLE 6. ESTIMATED RETURNS TO SUMMER PASTURE PER COW-CALF UNIT, SOUTHWESTERN SASKATCHEWAN, 1965 TO 1972

Year	Gross Return	Return to Labor and Summer Pasture	Labor Allowance	Return to Summer Pasture
	– $ per cow-calf unit –			
1965	84.79	17.64	10.94	6.70
1966	103.06	33.64	12.05	21.59
1967	108.70	34.91	13.11	21.80
1968	109.74	30.02	13.86	16.16
1969	133.39	51.43	14.56	36.87
1970	142.68	57.74	14.91	42.83
1971	152.17	63.90	15.70	48.20
1972	172.60	74.86	17.01	57.85

Relationship of Return to Summer Pasture and Winter Feed Costs

An important factor affecting the cost of winter feed is the price of cash grain crops which are the best alternative on land used for oat-hay or tame hay production. Budget data, based on relative yield experience between wheat and hay at Swift Current, show that an increase of 10 cents in the price of wheat decreases the return to summer pasture by 30 cents per cow-calf unit month of summer grazing[4].

Relationship of Return to Summer Pasture and Price of Feeder Calves

A rise of 1 cent per pound in the price of feeder calves can be expected to increase the return to summer pasture by 84 cents per cow-calf unit month.

Relationship of Return to Summer Pasture and Both the Above Factors

These relationships are summarized in Table 7. The base budget was calculated on 1971 non-feed costs and on feed input levels of that year. As the relative value of the various feeds changes, the composition and amount of the winter "feed basket" could also change in the direction of lowering the estimated winter feed cost as

[4] Wiens, J.K. and Kilcher, M.R., "Winter Feed Production on Grain-Cattle Farms in Saskatchewan", *Canadian Farm Economics*, Canada Department of Agriculture, Volume 5, Number 6, February 1971.

TABLE 7. RETURN PER COW-CALF UNIT MONTH OF SUMMER GRAZING (FIVE-MONTH PERIOD) FOR DIFFERENT LEVELS OF CATTLE PRICES AND DIFFERENT LEVELS OF WHEAT PRICES

Cattle Price (Good Feeder Steer Calves)	Farm Wheat Price — $ per bushel —					
	1.50	2.00	2.50	3.00	3.50	4.00
— $ per cwt. —			— $ per cow-calf unit month —			
25						
30	-1.97					
35	2.23	.73	-.77			
40	6.43	4.93	3.43	1.93	.43	-1.07
45	10.63	9.13	7.63	6.13	4.63	3.13
50		13.33	11.83	10.33	8.83	7.33
55			16.03	14.53	13.03	11.53
60				18.73	17.23	15.73
65					21.43	19.93
70						24.13
Cost of T.D.N. per Pound from Brome-Alfalfa Hay (cents)	1.78	2.23	2.69	3.14	3.60	4.05
520 pounds of T.D.N. required per cow-calf unit month of summer grazing						
Cost of 520 pounds of T.D.N.	9.25	11.60	14.00	16.35	18.70	21.10

grain prices increase from the base budget. Thus, the return to summer pasture for higher wheat prices would be somewhat more than is shown in Table 7.

Grass-legume hay produced on arable land competes for land use with cash grains such as wheat. The break-even price of grass-legume hay depends on the relative yields of hay and wheat and on the marginal machinery and crop service costs of an additional acre of wheat versus an additional acre of grass-legume hay production[5]. The competitive relationship can also be expressed on the basis of average machinery and crop service costs for each of the enterprises. This would be the relevant set of costs to use for one enterprise or the other on a farm unit. The cost per pound of TDN from grass-legume hay in relation to the price of wheat as shown in Table 7 is based on:

(1) the relative yield of grass-legume hay and wheat established by tests at this Swift Current Research Station;

(2) updated machinery and crop services for the grain enterprise obtained in a farm survey[6]; and

(3) machinery and crop service costs in hay production[7].

Based on N.R.C. feed standards[8], the summer feed requirements per cow-calf unit month are about 520 pounds of total digestible nutrients. This level of feed costs for the different price levels of TDN is shown in Table 7.

OBSERVATIONS ON THE USE OF FORAGE

Several observations can be made about the economics of forage use from the relationship shown in Table 7.

[5] Wiens, J.K. and Kilcher, M.R., "Winter Feed Production on Grain-Cattle Farms in Saskatchewan", *Canadian Farm Economics*, Canada Department of Agriculture, Volume 5, Number 6, February 1971.

[6] Sorboe, M., "Farming in the Cypress Hills Area of Saskatchewan" *Canadian Farm Economics*, Canada Department of Agriculture, Volume 6, Number 6, February 1972.

[7] Farm Management Data Manual, Farm Management Branch, Alberta Department of Agriculture.

[8] National Research Council, National Academy of Sciences, Washington, D.C., Publication 504.

Economics of Summer Pasture Use

With a cattle-wheat price relationship such as existed in the 1968-1972 period (Table 8), more intensive use of existing pasture should be considered. There are three ways of increasing the intensity of pasture use.

One example is delayed grazing on native prairie ranges. The productivity of a native range pasture grazed from mid-May to mid-October can be increased by an estimated 23 percent when the grazing is started about June 5 instead of around May 15. Such a practice should be considered when the cost of alternative grazing or feeding in spring is less than 2.25 times the cost of summer grazing[9].

There is also pasture improvement work which can take different forms, depending on the area. Breaking native rangeland in the Brown and Dark Brown Soil Zones and seeding to improve grass species may be expected to triple the grazing capacity of a fixed land area[10]. The value of this additional grazing must be greater than the direct cost of the improvement work plus the cost of grazing lost during the development period. Cattle and wheat prices at the 1971-73 period level make such an economically viable investment an alternative to consider. At the current initial Canadian Wheat Board price of wheat to farmers, about 45 cents per pound for feeder steer calves is required to pay for all non-land summer pasture costs. The latter costs include such items as fencing, water development, corrals and supervision.

Table 7 shows how critical the future prices of cattle and cash grains are in making a capital pasture improvement decision. A 5-cent change in feeder cattle prices per pound will increase the return to summer pasture by $21 or $4.20 per month times five months. This cash flow amortized at eight percent over a 20-year period has a present value of $206.

Another way of increasing the intensity of pasture use is through pasture management. An example would be fertilizer use. Pasture productivity will respond positively to some level of fertilizer application. The degree to which such a practice is economical is affected not only by the average response but also by the inter-year distribution of the fertilizer response. Whether the productivity increase can be expected to be more valuable in years of low production than in years of high production has not been determined.

Pasture development feeder cattle prices at the 1972 and 1973 levels have provided the incentive to develop more lands for summer grazing. This land has come from several former uses, an example being small areas of unimproved pasture land area that have been developed for pasture. This land is frequently referred to as wasteland. However, it often provides some late fall or early spring grazing. As this area is developed for summer grazing, more pressure will be put on other sources of late fall and early spring grazing resources.

Land which was also once used for grain production is now being seeded down. The price relationship between feeder steers and wheat for 1971 was $1.45 per bushel for wheat for the 1971-72 crop year and $43.29 per hundredweight for feeder steer calves in the fall of 1971. This approximates a level at which the production of grass-legume hay used for summer feeding of a cow-calf enterprise can compete with wheat production on some soils in the Brown and Dark Brown Soil Zones. If such a price relationship occurs again, full or partial confined

TABLE 8. FARM CATTLE AND WHEAT PRICES FOR THE SASKATOON AREA

Year[1]	No. 1 Wheat (22 cent freight zone)	Good Stocker Steer Calves	Bushels of Wheat Equal to 100 Pounds of Steer Calves
	–$/bushel–	– $/100 pounds –	
1961	1.73	21.66	12.5
1962	1.69	24.47	14.5
1963	1.79	25.00	14.0
1964	1.71	21.45	12.5
1965	1.82	22.90	12.6
1966	1.81	27.50	15.2
1967	1.63	29.45	18.1
1968	1.51	29.10	19.3
1969	1.38	36.10	26.2
1970	1.48	38.25	25.8
1971	1.71	39.52	23.1
1972	1.97	45.69	23.2
1973	3.56[2]	52.63	14.8

[1] Calendar year for cattle and crop year for wheat. The crop year is designated by the year in which the crop year starts.

[2] Initial payment, June 1974.

SOURCE: The Wheat Review, Statistics Canada, Catalogue 22-005, monthly, Livestock and Animal Products Statistics, Statistics Canada, Catalogue No. 23-203, annual. Canada Livestock and Meat Trade Report, Agriculture Canada.

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[9] Wiens, J.K. and Lodge, R.W., "Some Economic Aspects of Delayed Grazing on Native Range Pasture", *Canadian Farm Economics,* Agriculture Canada, Volume 8, Number 3, June 1973.

[10] Wiens, J.K., Lodge, R.W. and Johnston, A., *Seeding Prairie Rangelands - A Management and Economic Guide,* Economics Branch, Research Branch, Canada Department of Agriculture 69/13, September 1969.

feeding of some cow-calf enterprises could develop. This would create a new beef production system in the Brown and Dark Brown Soil Zones.

The yield difference of grasses when grazed or cut for hay must be considered. Clark and Heinrichs[11] conclude as follows: "The grasses when clipped three times yielded 76 percent as much as when they were cut only once, while the grass-alfalfa mixtures yielded only 62 percent as much when clipped as when cut once for hay". At some feed values, this additional yield from haying will compensate for the additional cost of haying, the hay feeding cost, drylot development cost, and animal health.

Recent results of corn silage production at the Brandon Research Station could result in more confined feeding for the beef production system.

SUMMARY

The Brown and Dark Brown Soil Zones are an important source of feeder cattle in Canada. The absolute price of feeder cattle and their price relative to cash grain prices are the two main factors in determining the number of feeder cattle produced in the area.

The most important input in the production of feeder cattle is feed. Pasture land that is sub-marginal for grain production is valued on the basis of a residual return from the feeder cattle production enterprise. The value of this pasture land is inversely related to the price of cash grains and positively related to the price of feeder cattle.

[11] Clark and Heinrichs, Grass-Legume Mixture Trials, Canada Department of Agriculture, Ottawa, Ontario, 1957.

The economics of forage use for feeder cattle production is affected by the absolute price of feeder cattle and by their price relative to cash grain production. Some of the trends and developments in feed sources for this production enterprise for some combinations of the above two product prices can be projected:

1. High grain and high cattle prices should result in:

(a) small areas not used for crop production and grain crop residues being more intensively used for fall and spring grazing and for winter feeding;

(b) increased production of higher yielding feed crops such as corn silage. The value of feed must be high enough to compensate for the higher level of inputs;

(c) breaking of native pastures and seeding for more productive grasses and legumes; and

(d) pastures being used more intensively.

2. High grain and low cattle prices should result in:

(a) arable pastures being broken and used for grain production;

(b) a shorter winter feeding period;

(c) an increase in the use of native hay for winter feed; and

(d) an increase in the use of crop residues for winter feed for fall and spring grazing.

3. Low grain and high cattle prices should result in:

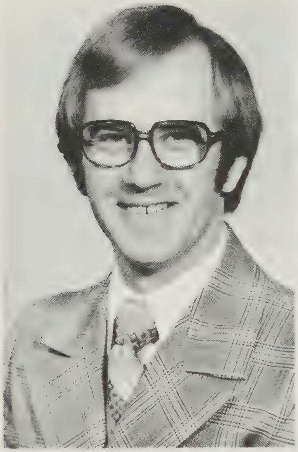
(a) breaking of native pastures and seeding for more productive grasses and legumes;

(b) pastures being used more intensively;

(c) marginal grain land being seeded for pasture and hay; and

(d) a longer winter feeding period.

AN ANALYSIS OF DOMESTIC USE AND SALES TRENDS FOR CANADIAN TOBACCO



*N.L. Longmuir**

Cigarette and cigar sales are expected to increase in the future, and cigarette tobacco and other tobacco product sales are likely to decline. Gross farm incomes of tobacco growers could average $250 million per year by 1978, with flue-cured tobacco remaining the dominant type.

INTRODUCTION

Tobacco is one of the most valuable crops produced and marketed in Canada. Total farm value in 1973 was $202.6 million.[1] The average farm value in the 1967-71 period was $149.7 million compared to an average of $107.9 million from 1962 to 1966. About 98 percent of all farm value is derived from the production of flue-cured tobacco. About 90 percent of the flue-cured acreage produced is concentrated in Southwestern Ontario, along with small acreages of dark and burley tobaccos. The remaining 10 percent is grown in Quebec and the Maritimes. Quebec also grows cigar and pipe tobacco.[2]

Since 1970, tobacco has ranked fifth only to wheat, barley, rapeseed and flaxseed in value of agricultural exports. Exports in 1973 amounted to $58 million and consisted almost exclusively of flue-cured tobacco.[3]

Canada's share of the world tobacco market is about three percent and is approximately seven percent of the world flue-cured tobacco market. Canadian exports of flue-cured tobacco have averaged about 30 percent of domestic production during the last decade (Table 1).

The domestic share of about 70 percent of production is primarily utilized in the manufacture of straight flue-cured virginia type cigarettes and fine cut tobacco for cigarette use.[4] An examination of the recent trends in

TABLE 1. CANADIAN FLUE-CURED TOBACCO PRODUCTION AND UTILIZATION 1962-1973

Crop Year (October-September)	Production	Utilization Domestic	Export
	'000 kgm. greenweight	% age	
1962-66	81,684	70.5	29.5
1967-71	98,615	67.2	32.8
1972	82,081	68.2	31.8
1973	114,065	72.5	27.5

SOURCE: Statistics Canada 22-205 and 65-004 (converted to metric by author)

*Nelson Longmuir is an economist with the Economics Branch Agriculture Canada.

[1] Statistics Canada, *Leaf Tobacco Acreage, Production and Value, 1973;* June 1974, 22-205, page 1.

[2] Agriculture Canada, *Situation/Outlook 74,* Canadian Agricultural Outlook Conference, Ottawa, January 1974, page 156.

[3] Statistics Canada, *Trade of Canada-Exports,* 65-004, December 1973.

[4] Canadian smokers prefer a straight-flue-cured virginia tobacco rather than a blended (flue-cured, turkish, burley, oriental) American type cigarette.

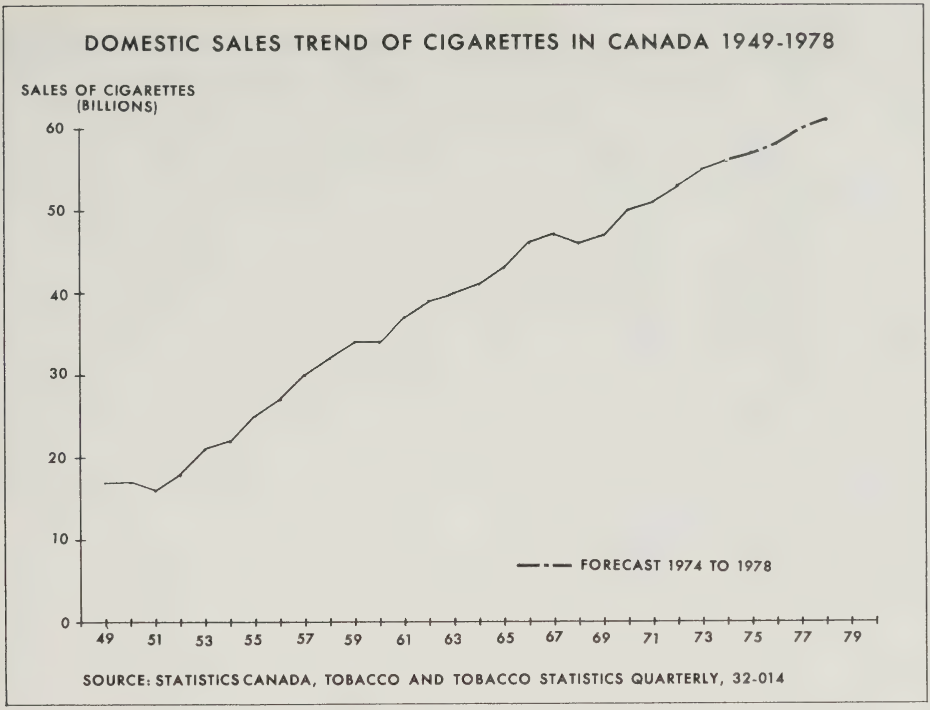


Figure 1

domestic use and sales of Canadian tobacco would provide some insight into the future direction that domestic demand could take. Some of the factors affecting the domestic utilization of flue-cured tobacco should first be noted.

TRENDS IN DOMESTIC USE OF FLUE-CURED TOBACCO

Domestic market utilization for flue-cured tobacco averaged 70.5 percent of production during the period 1962-66, declining to 67.2 percent during the 1967-71 period (Table 1). In 1973, domestic use was about 72.5 percent compared to 68.2 percent in 1972.

There has been a downward trend in the domestic utilization of flue-cured tobacco in cigarette manufacturing in Canada. This is partly due to the increased consumption of filter-tipped cigarettes and technological advancements that have enabled manufacturers to better utilize the entire tobacco leaf.

During the 1968-1972 period, lamina utilization has amounted to 80 percent of the flue-cured tobacco used in cigarette manufacture; scraps and stems accounted for 19 percent and whole leaf for about one percent.[5]

Domestic use of flue-cured tobacco for cigarettes has decreased from an average of 53.3 million kilograms redried weight during 1962-66 to an average of 48.1 million kilograms redried weight during 1967-71.[6] In 1973, 50.9 million kilograms redried weight of domestic flue-cured tobacco was utilized, about six percent more than the five-year average during the 1967-71 period. The apparent upswing in total usage for 1972 and 1973 was primarily due to a levelling off of the amount of tobacco used per thousand cigarettes (0.9901 kilograms) and the increased production of cigarettes in those years. The amount of flue-cured tobacco per thousand cigarettes has declined by about 50 percent since 1949.

The introduction of "new smoking materials (NSM)" (derived from wood pulp processed into sheets of cellulose and then shredded and mixed with tobacco) could further decrease the amount of tobacco used in cigarette manufacture. Test marketing of cigarettes is already underway in Great Britain, where between 10 and 50 percent of the NSM is being used.[7] The new

[5] Lamina is the tobacco leaf minus the mid-rib.

[6] Greenweight is the farm sales weight of tobacco after curing. Redried weight is equivalent to 0.89, the weight of greenweight tobacco.

[7] "Smokers to Test NSM" - Delhi News Record, Wednesday, August 7, 1974, page 13.

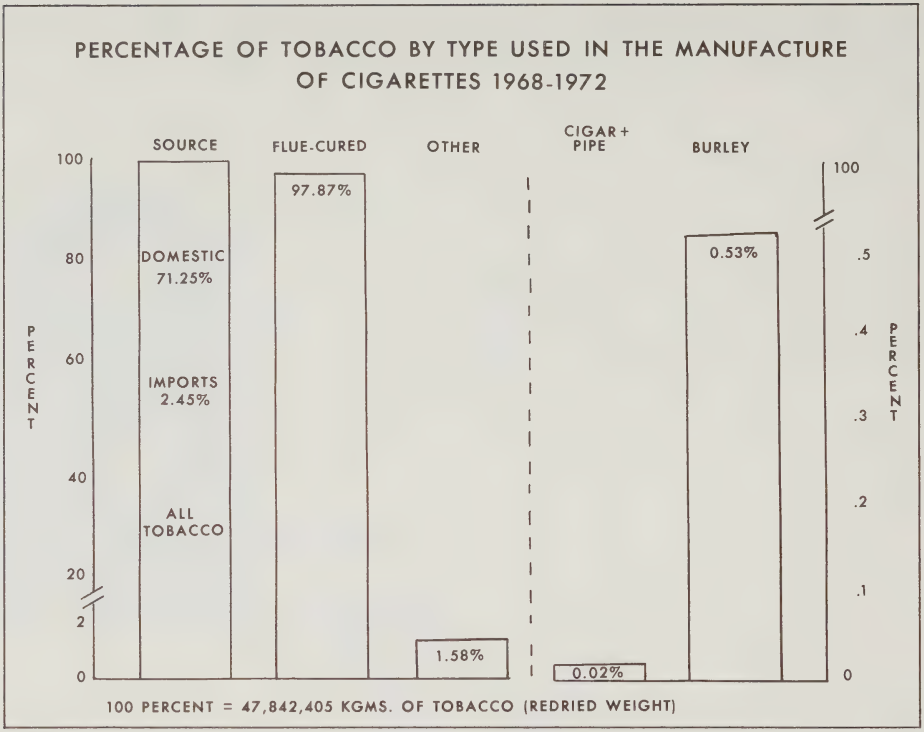


Figure 2

cigarette is reported to be "safer" and produces four times less tar than conventional cigarettes using 100 percent tobacco. Positive results to prove that the NSM is safe to smoke are not expected for at least two years. However, the technology could be readily adopted in Canada if proven safe and by 1978 one could estimate that the amount of tobacco used per thousand cigarettes could drop by about 35 percent, down to 0.6435 kilograms. The most important factor to examine may be the trend in cigarette sales to determine the possible direction and need for flue-cured tobacco by 1978.

DOMESTIC SALES TRENDS FOR CIGARETTES

Since 1949 domestic sales of cigarettes have increased at an average rate of 5.25 percent per year up to 1973. However, the annual rate of increase has declined. Between 1964 and 1973 the annual rate of increase averaged 2.95 percent. During the 1962-66 period sales averaged 41,697 million cigarettes and increased by about 15 percent to an average of 48,081 million cigarettes during 1967-71. In 1973, cigarette sales totalled 54,864 million or 14 percent more than the 1967-71 average. Forecasts indicate that between 1974 and 1978 sales could average about 58.4 billion cigarettes.[8]

Coupled with the domestic sales of cigarettes is the important factor of the source of tobacco supplies. The composition of Canadian cigarettes is unlikely to change from the 100 percent flue-cured virgina type. Figure 2 shows the average percentage breakdown by type of tobacco for all cigarettes during the period 1968-72. Flue-cured tobacco accounted for 97.87 percent, while burley, cigar, pipe and others accounted for 0.53, 0.02 and 1.58 percent respectively. Of the 47.8 million kilograms of tobacco used in the manufacture of cigarettes, 97.55 percent was from domestic sources and 2.45 percent was imported (Figure 2).

[8] N.L. Longmuir, "Trends in Domestic Use and Exports of Canadian Tobacco", paper presented at the 25th Tobacco Workers Conference, Hamilton, Ontario, August 9, 1973. The estimates used in this article are revisions of forecasts made last year.

CHANGES IN PER CAPITA UTILIZATION OF TOBACCO

Domestic utilization of tobacco is influenced by smokers' tastes and preferences as well as their attitudes toward health. Per capita adult consumption of cigarettes has been increasing at an annual rate of 3.1 percent since 1949. There was a sharp decline in per capita consumption in 1968, due in part to medical findings linking cancer and smoking. Since 1968 per capita consumption has been increasing. In an attempt to curb total consumption, television cigarette advertising was stopped on January 1, 1972. The Department of Health and Welfare also insisted on notices being placed on all cigarette packages to warn smokers of health hazards. However, domestic cigarette sales in 1972 rose 4.76 percent over 1971 sales and 1973 sales increased by 2.95 percent over 1972 sales. Per capita cigarette consumption in 1973 was 3,706 cigarettes, up 1.7 percent from the 1972 level of 3,643 cigarettes.

A brief review of the actual amount of tobacco consumed by weight per capita increased between the years 1949 and 1968. Since 1968, the actual amount consumed has decreased slightly (Table 2).

One of the causes of the decline in the rate of increase of cigarette sales is the steady increase in the percentage of non-smokers, mainly due to adult males giving up smoking and, to a lesser extent, adult females[9]. It is estimated that there has been a decrease of half a million cigarette smokers in Canada between 1965 and 1972. In 1965 there were about 6.61 million smokers and about 6.15 million in 1972. If we consider only the smoking population, the number of cigarettes consumed per

TABLE 2. PER CAPITA CONSUMPTION OF CIGARETTES AND TOBACCO. 1949-1973

Year	Cigarettes per Capita	Kilograms of Tobacco per 1,000 Cigarettes	Kilograms of Tobacco per Capita
		– Redried weight –	
1949-53	1,801	1.9519	3.5153
1954-58	2,463	1.6284	4.0107
1959-63	3,020	1.3870	4.1887
1964-68	3,358	1.2006	4.0316
1968-73	3,568	0.9636	3.4381
1978+	4,200	0.7700	3.2340

+Estimated

[9] Health and Welfare Canada, "Growth in the Non-Smoking Population", September 1973.

TABLE 3. PERCENTAGE OF NON-SMOKERS* IN THE POPULATION 15 YEARS AND OVER, BY SEX AND AGE GROUP, CANADA, 1965, 1970, 1972.

Sex	Age Group	1965	1970	1972	Difference 1965-70	Difference 1965-72
BOTH SEXES	Total 15 years and over	50.2	52.9	53.6	2.7	3.4
	15 – 19	68.9	65.1	63.0	−3.8	−5.9
	20 – 24	42.6	46.0	47.4	3.4	4.8
	25 – 44	42.1	45.7	47.4	3.6	5.3
	45 – 64	48.1	52.5	52.7	4.4	4.6
	65 years and over	66.8	70.3	71.4	3.5	4.6
	Total 20 years and over	47.2	51.0	52.0	3.8	4.8
MALES	Total 15 years and over	34.8	41.1	42.6	6.3	7.8
	15 – 19	60.3	59.1	59.3	−1.2	−1.0
	20 – 24	30.4	38.0	39.4	7.6	9.0
	25 – 44	27.8	34.8	37.0	7.0	9.2
	45 – 64	30.1	38.4	39.4	8.3	9.3
	65 years and over	42.3	49.2	51.5	6.9	9.2
	Total 20 years and over	30.6	38.1	39.8	7.5	9.2
FEMALES	Total 15 years and over	65.3	64.5	64.3	−0.8	−1.0
	15 – 19	77.8	71.3	67.0	−6.5	−10.8
	20 – 24	54.4	54.2	55.5	−0.2	1.1
	25 – 44	56.1	56.6	57.7	0.5	1.6
	45 – 64	66.2	66.1	65.5	−0.1	−0.7
	65 years and over	88.8	87.9	87.8	−0.9	−1.0
	Total 20 years and over	63.4	63.5	63.9	0.1	0.5

*Non-Smoker Male — does not smoke cigarettes, pipe or cigars.
Female — does not smoke cigarettes.

SOURCE: Percentages based on data collected with the Labour Force Surveys by Statistics Canada.

TABLE 4. PERCENTAGE OF REGULAR CIGARETTE SMOKERS IN THE CANADIAN POPULATION, 20 YEARS OF AGE AND OVER, ACCORDING TO THE NUMBER OF CIGARETTES SMOKED PER DAY, 1965, 1970, 1972.

SEX	NUMBER OF CIGS. SMOKED PER DAY	1965	1970	1972	— Difference — 1965-70	— Difference — 1965-72
BOTH	1 – 10	11.2	9.2	8.7	−2.0	−2.5
	11 – 25	30.2	28.6	28.0	−1.6	−2.2
	26 +	3.9	4.4	4.3	0.5	0.4
	TOTAL REGULAR SMOKERS	45.3	42.2	41.1	−3.1	−4.2
FEMALE	1 – 10	11.5	9.6	9.0	−1.9	−2.5
	11 – 25	20.2	22.0	21.7	1.8	1.5
	26 +	1.4	- 2.0	2.2	0.6	0.8
	TOTAL REGULAR SMOKERS	33.1	33.6	33.0	0.5	−0.1
MALE	1 – 10	10.9	8.8	8.5	−2.1	−2.4
	11 – 25	40.4	35.5	34.5	−4.9	−5.9
	26 +	6.6	6.8	6.5	0.2	−0.1
	TOTAL REGULAR SMOKERS	57.9	51.1	49.5	−6.8	−8.4

SOURCE: Based on Labour Force Surveys by Statistics Canada.

smoker has increased by about 33 percent between 1965 and 1972. In other words, the average smoker in 1965 smoked 6,507 cigarettes compared to 8,665 cigarettes in 1972. It is anticipated that the number of smokers will decline between 1974 and 1978 by an additional quarter of a million smokers. Cigarette consumption per smoker will likely increase an additional thousand cigarettes per year if current trends hold over the next five years.

The age distribution of the smoking population can affect cigarette sales due to the habitual effect of smoking. As smokers get older they tend to smoke more heavily and thus consume more cigarettes per day than a young, beginning smoker. However, as is mentioned above, the recent survey conducted by Statistics Canada reveals that there is an increase in the percentage of the non-smoking population in Canada. Between 1965 and 1972 there has been a decrease in the smoking population of about 4.8 percent. The male smoking population decreased by 9.2 percent compared to one-half percent for the female smoking population for the same period (Table 3).

With retail sales of cigarettes increasing and the number of smokers decreasing, the recent trend in smoking habits indicates that the number who smoke between one to ten, and 11 to 25 cigarettes have decreased by 2.5 to 2.2 percent since 1965, and that the smokers who smoke more than 26 have decreased only 0.4 percent (Table 4). Daily consumption of cigarettes increased by one third, from 17.83 cigarettes per day in 1965 to 23.74 cigarettes per day in 1972. By 1978 it is estimated that the average smoker could consume about 27 cigarettes per day (Table 4).

CIGAR TRENDS

Sales of domestically manufactured cigars have increased since 1949 by about five percent per year. The annual rate of increase has been slowing in recent years and has declined to 3.3 percent per year between 1964 and 1973. Sales of cigars have dropped only three times, in 1950, 1959 and 1972. The projected sales of cigars in Canada between 1974 and 1978 are estimated at an average of about 648 million cigars per year (Figure 3).

The trend in cigar tobacco utilization by manufacturers peaked in 1964 at 4.7 million kilograms and has declined to 2.7 million kilograms in 1973. There has been a shift in the size of the cigar produced in Canada, from the larger type to the smaller type, due to the numbers of cigars produced increasing with their weight per thou-

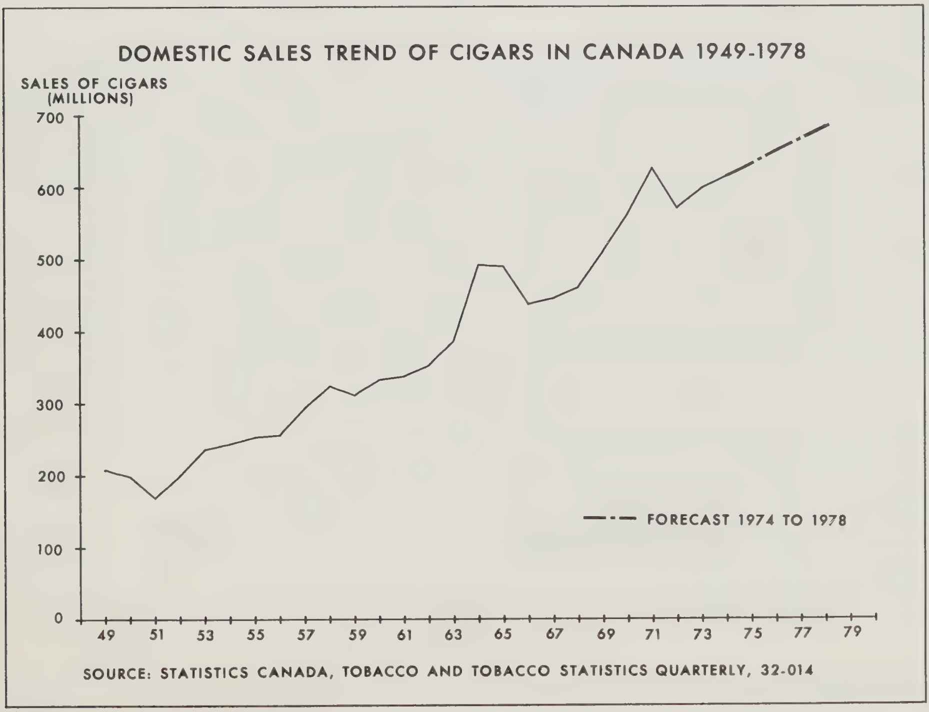


Figure 3

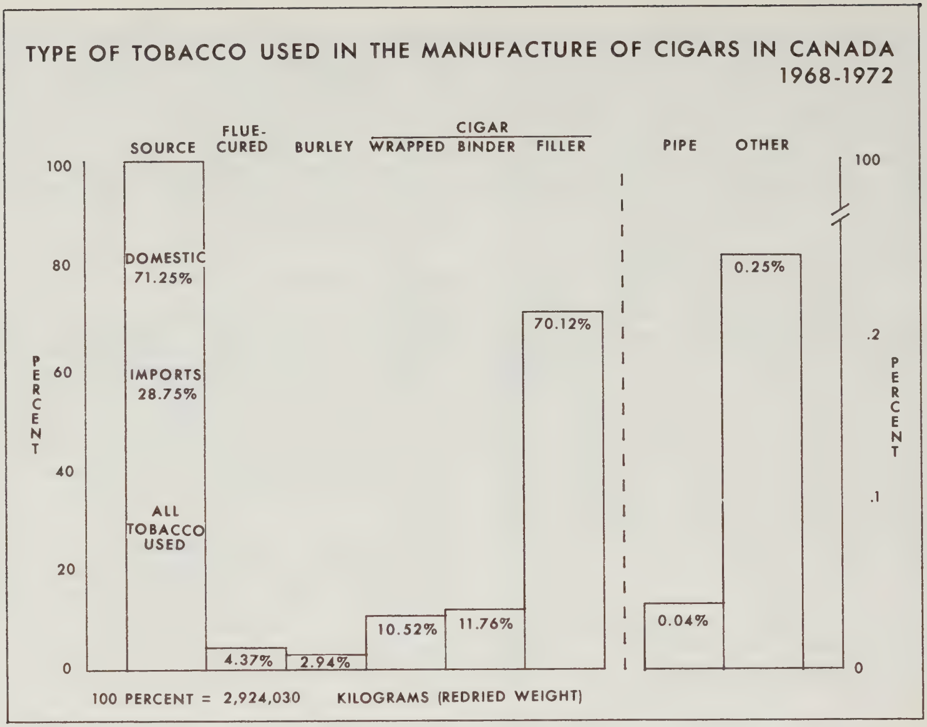


Figure 4

sand declining. The projected demand for cigar tobacco during the 1974-1978 period is expected to average 2.8 million kilograms, of which 70 to 75 percent is expected to be of domestic origin. In 1949 about 11.2036 kilograms of redried cigar tobacco was used in the manufacture of a thousand cigars in 1973; about 4.2456 kilograms were used per thousand cigars. Other types of tobacco used in the manufacture of cigars in Canada during 1968-1972 (compared to 1973 usage) is as follows: flue-cured tobacco averages 4.7 percent (2.5), and burley 2.94 percent (0.0). Domestic cigar manufacturers used 71.25 percent from domestic sources (72.56) and 28.75 percent from foreign sources (27.43) (Figure 4).

Cigar and pipe smokers have not changed drastically since 1965. The largest decline in smokers of pipes and cigars occurs in the over-65 grouping with a 6.7 percent decrease between 1965 and 1972.[10] The long-run trend of sales indicates an increase of 3.3 percent per year for cigars, and a decline of 1.78 percent for other tobaccos (including pipe tobacco). In the future, there will be a limited demand for pipe and cigar tobacco.

[10] Health and Welfare Canada, "Growth in the Non-Smoking Population", September 1973.

OTHER TOBACCO PRODUCT TRENDS

Between 1949 and 1973 the annual rate of decline in the sale of cut tobacco for cigarette making has been 2.65 percent. However, between 1964 and 1973, the annual rate of decline has been 1.98 percent per year. This tends to reflect the resurgence of "roll your own" as opposed to "tailor made" cigarettes. Since 1970 there have been a number of small cigarette making machines marketed and the declining trend of cut tobacco sales has slowed somewhat. Similarly, other tobacco product sales (i.e. plug, snuff and raw leaf) have declined at an annual rate of 3.9 percent per year since 1949, and the rate of decline increased between 1964 to 1973 to 5.25 percent per year. The rate of decline rose due to a decline in the smoking population of 65 years and over.

RETAIL TOBACCO PRICE INDEX TRENDS

The Cigarette Price Index has increased by 46.9 percent since 1961 and has risen sharply in the latter half of the 1960's. The Tobacco Products Index has risen 46.2 percent during the same period and the Cigarette Tobacco Index increased 39.6 percent. These indexes reflect the relative price increases since 1961. They are expected to rise during 1974 due to increases in the wholesale price of 2 cents per pack of 20 cigarettes and

15 cents per tin for cut tobacco. Future price growths could curtail smoking but the current level of pricing has not curbed smoking to the point where the quantity smoked is decreasing due to pricing.

In an attempt to prevent future price increases, tobacco companies will probably try to reduce the amount of tobacco per cigarette. The re-introduction of shorter cigarettes is already taking place in Canada at a lower price (due to less tobacco). Another pricing factor is the test marketing in the United Kingdom of new smoking material blended with tobacco. If this new process is successful, Canadian manufacturers will probably adopt this technology to maintain profit margins and keep wholesale prices of tobacco stable.

FUTURE DIRECTIONS

The major portion of this paper has dealt with an analysis of past trends for Canadian tobacco, in particular flue-cured tobacco. Estimates of domestic use and sales in Canada were based on past trends and projections which were in turn based on a regression analysis with adjustments in estimates to 1978. Domestic utilization for cigarettes and fine-cut cigarette tobacco estimates were made, assuming that cigarette sales will increase at a rate of about three percent per year, the amount of tobacco per thousand cigarettes remains constant, the decline in fine-cut tobacco does not exceed two percent per year, and the smoking population does not decline by more than a quarter of a million smokers.

Domestic utilization might be expected to range between 57 and 65 million kilograms, greenweight, by 1978. This range also contains an adjustment factor for inventory requirements not studied in the article.

The future direction of cigarette consumption might be affected by the development of the "safer" cigarette utilizing less tobacco and substituting NSM. If successfully developed and introduced, tobacco content in cigarettes could decrease by about 35 percent. On the other hand, the smoking population might increase, because smoking would be safer and per capita cigarette consumption might increase to affect the reduction of tobacco per cigarette.

Cigar sales and cigar tobacco utilization is expected to increase in the future. However, our domestic production is less than our requirements and expansion will be slow.

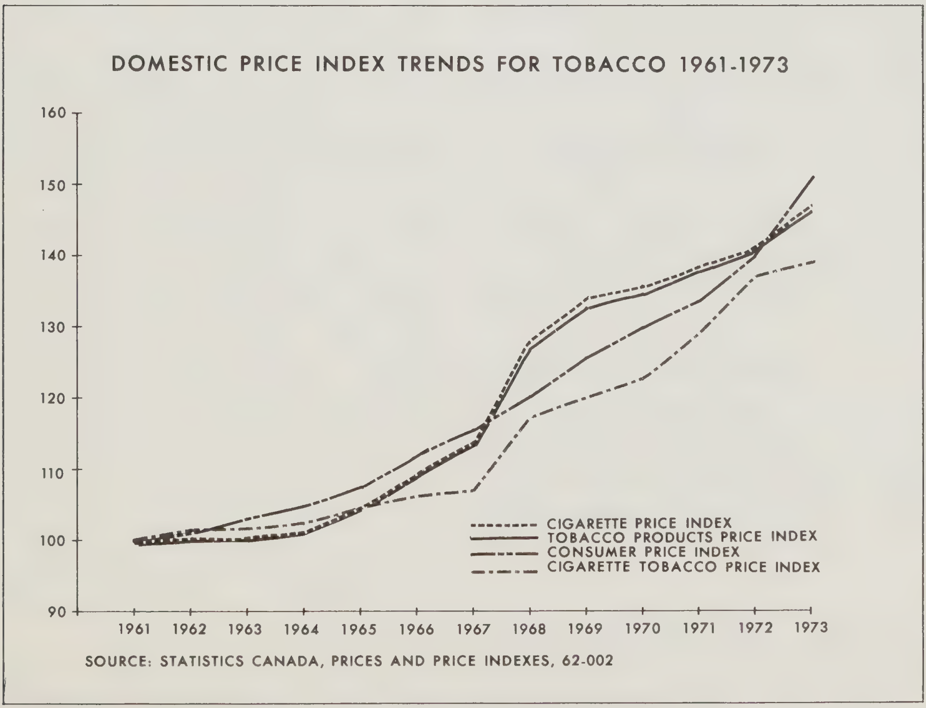


Figure 5

Other tobacco products such as snuff, plug and twist tobacco are declining and probably will continue to do so, due in part to the decrease of users 65 years and over.

The impact that these future directions have on farm incomes for Canadian tobacco growers is difficult to assess. If domestic needs for all types of tobacco average 72.5 million kilograms, greenweight, during the 1974-78 period, farm incomes from domestic utilization could approach an average of $155 million.

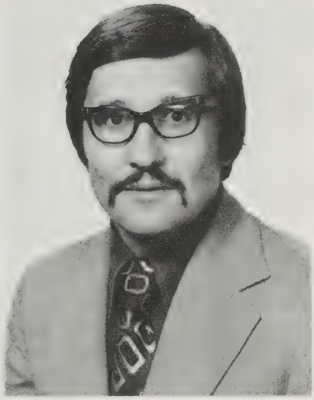
In conclusion, cigarette and cigar sales can be expected to increase and cigarette tobacco and other tobacco products sales to decline. Domestic utilization of Canadian tobaccos is likely to expand, despite the threat of new smoking materials and improved manufacturing methods which could limit this expansion.

THE JAPANESE HOG-PORK SECTOR: SOME IMPLICATIONS FOR CANADIAN PORK EXPORTS

Japan, while a small per capita pork consumer, has become a major pork importer. Canada's second most important export market for pork in 1972 and 1973 has been the Japanese market.

However, there is a growing trend in Japan in the desire to become more self-sufficient. While this supports the forecast that a decrease in pork imports will occur, a more thorough analysis of the situation is required in making such a projection.

*J.C. Lowe**



INTRODUCTION

The expansion and stabilization of Canada's pork industry depends largely on efforts to gain knowledge useful in the development of export markets. The Japanese market for Canadian pork became Canada's second most important export market for pork in 1972 and 1973, slightly below the U.S. in terms of value.

Japan has several basic physical and economic characteristics which make it a very attractive market to most exporters of agricultural products. It is a country of about 105 million people with a total land area about the size of Newfoundland, not all of which is inhabitable. Surprisingly, with only 15 percent of the total land under cultivation, Japan is about 75 to 80 percent self-sufficient in food production. Nevertheless, livestock production is supported by importing almost all of its feed grain requirements.

With one of the world's highest growth rates in real income per capita and a growing taste for the "Western" style of life, including foods, Japan's demand for such agricultural products as pork has surpassed domestic production.

Considerable speculation surrounds the potential of this market as an outlet for Canadian pork. The purpose of this paper is to extend present descriptive analyses and projections of Japanese pork production, consumption and imports. It is essentially an effort to document some of the perceived relationships and trends in that market and to suggest possible implications for further Canadian market development. To do this, an econometric model using annual data from 1953 to 1972 was developed. References to quantitative estimates of relationships among important variables in the Japanese hog-pork sector and demand-supply projections are derived from the model[1].

PORK PRODUCTION TRENDS

Pork production in Japan supplies most of the domestic requirements and is characterized by: (1) nearly complete dependency on imported feed; (2) a government pork price stabilization policy; (3) small producing units; and (4) constraints to expansion associated with limited land area and pollution.

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*Dr. J.C. Lowe is an economist with the Economics Branch, Agriculture Canada, Regina, Saskatchewan.

[1] An econometric model is a statistically estimated equation or system of equations which represent the relationships and interdependencies between variables of an economic system, i.e., the demand, supply and price structure for a commodity. A paper presenting the details of this model is in preparation and may be obtained from the author.

TABLE 1. JAPANESE HOG FARMS, HOG NUMBERS AND PORK PRODUCTION, 1955-72

Year	Farms	Head	Head/ Farm	Hog No. Comparison With Previous Year	Head Slaughtered	Production	Average Carcass Weight	Annual Change in Production
				%	'000	M/T	Pounds	
1955	527,900	825,160	1.56	99.1	1,660	82,479	109.5	
1956	635,110	1,170,230	1.79	141.8	2,150	107,772	110.5	30.7
1957	817,790	1,546,480	1.89	132.2	2,673	137,051	113.0	27.2
1958	833,800	1,649,100	1.98	106.6	3,131	161,140	113.5	17.6
1959	941,100	2,244,300	2.38	136.1	3,562	182,752	113.1	13.4
1960	799,120	1,917,580	2.40	85.4	2,836	147,318	114.5	-19.4
1961	929,900	2,639,950	2.84	137.7	3,948	206,288	115.2	40.0
1962	1,025,260	4,032,740	3.93	152.8	6,244	324,188	114.5	57.2
1963	802,560	3,296,000	4.11	81.7	5,386	279,354	114.3	-13.8
1964	711,200	3,461,280	4.87	105.0	5,700	298,057	115.3	6.7
1965	701,560	3,975,960	5.67	114.9	6,785	363,513	118.1	22.0
1966	714,300	5,158,370	7.22	129.7	9,410	504,667	118.2	38.8
1967	649,500	5,975,000	9.20	115.8	10,329	556,760	118.8	10.3
1968	530,600	5,535,000	10.43	92.6	9,546	520,242	120.1	-6.6
1969	461,030	5,429,080	11.78	98.1	9,172	508,461	122.2	-2.3
1970	444,500	6,335,000	14.25	116.7	11,467	648,193	124.6	27.5
1971	398,300	6,904,000	17.33	109.0	12,998	749,693	127.2	15.6
1972	339,700	6,985,000	20.56	101.2	13,072	769,431	129.8	2.6

SOURCE: Japanese Meat Statistics, Japanese Meat Conference, Pages 6 and 10.

NOTE: M/T = metric ton = 2204.6 pounds.

Production of pork has been growing at an annual rate of about 10 percent in the last decade or about 160 percent for the 1963 to 1972 period. While the production trend has been increasing, a definite cyclical pattern (of about five years) has also been displayed (Table 1).

Productivity has increased from about 220 pounds of pork produced per "head on farms" in 1955 to about 243 pounds in 1972[2]. Production per farm has also increased over the same period. In 1955, about 27,900 farms produced 82,479 metric tons of pork compared to the 769 thousand metric tons produced by 339,700 farms in 1972. This reflects a small but increasing enterprise size. The average weight of hogs slaughtered has also been increasing, rising from an average carcass weight of 109.5 pounds in 1955 to 127.8 pounds in 1972.

Given the structural changes occurring in the livestock sector, it is difficult to predict future production changes. The Japanese Ministry of Agriculture and Forestry has "projected" pork production to total 1,364 thousand metric tons by 1977 and 1,670 thousand metric tons by 1982. These increases would represent 13.3 and 8.0 percent average annual increases respectively over 1972 production, the former about equal to the average rate for any five-year period since 1955, the latter below recent growth rates. However, since hog enterprises are increasing in size and are becoming more specialized, past measures of performance may not be good indicators of the future. Extrapolation of linear trends of the past 10 years would place production at about 1 million metric tons by 1977 and about 1.2 million metric tons by 1982, both well below the Ministry's "targets".

Large Scale Production

In general, large scale hog producers enter the business not as a sideline or an adjunct to diversified farming, but as a specialized operation, according to a study of Japan's pork industry for the U.S. Feed Grains Council in 1968. These production units include both independent operators and co-operatives.

Production Costs and Efficiency

The production costs of Japanese pork is almost twice that of pork produced in Canada[3]. It is estimated that

[2] Annual carcass pork production divided by the number of pigs on farms.

[3] "Japan - An Opportunity for Pork Exports", - *Alberta Hog Journal*, October 1972, page 19.

80 percent of the feed ingredients of the ration is imported and that this accounts for the high cost.

In addition to production targets, the Ministry of Agriculture and Forestry periodically outlines production "performance" targets (feed conversion, reproduction ability, etc.) for Japanese agriculture.

Vertical Integration

In recent years, some of the large trading companies have taken an interest in hog production. One example is the Japan Farm Limited in which Mitsubishi holds a 40-percent interest along with a feed company and an agricultural products company. Hog production units capable of producing 100,000 head per year each are being planned[4].

Pork Stabilization Policy

The price stabilization policy consists of annually setting a maximum and minimum wholesale price for pork, and establishing import restrictions in the form of quotas and tariffs. If pork prices fall below the floor price, the Livestock Industry Promotion Corporation (LIPCO) is obliged to purchase the product to raise prices to the minimum level. If prices exceed the ceiling price, consideration is given to increasing imports. Until October 1971, import quotas and licenses were used as an import control technique along with an ad valorem tariff of 10 percent. The quota was eliminated then and a new tariff scheme instituted.

A standard import price is set on pork, midway between the floor and ceiling stabilization prices. The tariff equals the large amount of the difference between the S.I.P. and the C.I.F. price of imported pork, or 10 percent of the C.I.F. price. Import duty is waived when domestic prices are exceptionally high and when the C.I.F. price is above the maximum domestic price.

Environmental Issues

Agriculture has been affected by pollution as well as contributing to environmental disturbances itself. Emphasis on industrial efficiency has polluted both water and soil, which has influenced agricultural productivity. On the other hand, there are problems of agricultural chemical residue in farm products and the soil, and air and water pollution caused by livestock production. Increases in intensive livestock production, together with Japan's slow rate of progress in developing techniques of disposing of animal waste, has given rise to these problems.

Population density, a factor closely allied to the occurrence of pollution and other environmental problems, also directly influences the land available for agricultural expansion.

While Japan's average population density is 284 people per square kilometer (1971), about 21 percent of the land area has population densities of less than 67 people per square kilometer (171 per square mile). Considering that 70 percent of the population consists of urban dwellers, the rural area population density may still provide room for certain types of livestock production expansion, despite the fact that about 80 percent of the land area is mountainous.

An examination of the geographical distribution of livestock production in Japan reveals that the densely populated Kanto District (936 per kms.^{2}) in 1970 had about 32 percent of the hog population and nearly 26 percent of all livestock numbers[5]. Least densely populated areas appear to have the lowest percentage of total livestock numbers, with an example being Hokkaido.

Seasonal Hog Slaughter

A lack of similarity exists in the seasonality of hog slaughter between foreign and domestic markets. Examination of 1969 to 1972 data reveals that in Japan predominant slaughter peaks occur in March and December with minor seasonal increases in July and October. January typically reflects very low slaughters.

CONSUMPTION

One of the most noticeable changes in the demand for foods is the growing sophistication of the food consumption habits of the Japanese. Consumption of dairy and meat products and western vegetables, which have relatively high per unit costs, is increasing. In addition, the demand for vegetables is no longer seasonal. The demand for "secondary values" in food, such as appearance of products, is also growing. Growth in the consumption of processed foods is another important change. In the fiscal year, 1969, 44 percent of the total food expenditure was spent on processed foods. In addition, there is a growing tendency for the Japanese people to eat away from home[6].

[4] Mears, L.G. "Japan's Affluent Trading Companies Move Strongly Into Domestic Enterprises", *Foreign Agriculture*, USDA, Vol. VIII, No. 35. August 31, 1970, page 17.

[5] Data source courtesy Canadian Wheat Board, from Feed Handbook, 1972, compiled by the Ministry of Agriculture and Forestry.

[6] *White Papers* - Agriculture, Jetro, (1972), page 8.

Pork consumption per capita has increased from 3.6 pounds in 1969 to an estimated 17.2 pounds (carcass weight) per capita in 1972. The average retail price increased about 44 percent during the same period. This may be compared to per capita increases of 3.5 to 7.2 pounds for beef and 1.8 to 13.4 pounds for poultry during the same period (Table 2). While income is a major determinant of pork consumption, Japan has regulated imports and has maintained a domestic price stabilization program for pork, two factors which suggest that the rate of increase in consumption may be determined primarily by the available domestic production. The trend in pork consumption and prices over the past 20 years shows no indication of a levelling off of demand.

Factors influencing future Japanese total demand for pork include those which affect the population growth rate and consumption per capita. Factors which influence the latter, such as pork's substitutability with other meats, prices, and income, are of paramount importance.

Population

Growth and projected levels of the Japanese population are shown in Table 3. FAO projections indicate that Japan will have 120 million people by 1982. The Ministry of Public Works estimates populations of 108, 113 and 130 million respectively for the years 1975, 1980 and 2000. However, Japan's population growth rate may decline as it has in other developed countries in recent years and fall short of that used to make earlier projections.

Population is roughly 75 percent urban to 25 percent rural. This is advantageous to the introduction and development of new products and the application of promotional programs. Japan's population pyramid also

displays a relatively large youth group, particularly in urban areas. The younger Japanese have displayed a tendency to try new products, especially those embodying the "Western" influence.

TABLE 2. AVERAGE ANNUAL CONSUMPTION PER CAPITA (POUNDS) 1955 AND 1960-72

Year	Beef (Carcass Basis)	% Change	Pork (Carcass Basis)	% Change	Chicken	% Change
1955	3.1	–	2.0	–	.8	–
1960	3.5	12	3.6	78	1.8	116
1961	3.5	– 1	4.8	34	2.3	29
1962	3.5	1	7.5	55	2.8	23
1963	4.4	20	6.5	–13	3.3	22
1964	5.2	19	6.8	4	4.1	24
1965	4.9	– 6	8.1	19	4.7	14
1966	3.8	–23	11.2	38	5.5	17
1967	3.5	– 6	12.2	9	6.6	20
1968	3.8	7	11.5	– 6	7.5	13
1969	5.0	33	11.8	2	9.0	21
1970	6.0	10	14.1	20	10.5	17
1971	6.6	10	16.3	15	11.8	12
1972	7.2	9	17.2	5	13.4	14

SOURCE: The Meat Statistics In Japan, Japan Meat Conference, November 1, 1973.

TABLE 3. ESTIMATED TREND OF PURCHASING POWER AND POPULATION

Year	Personal Income	Personal Disposable Income	Population
	— yen per capita —		'000
1955	7,027	6,462	89,276
1956	7,751	7,128	
1957	8,377	7,760	90,924
1958	8,942	8,288	91,763
1959	10,011	9,290	92,638
1960	11,526	10,600	93,419
1961	13,712	12,542	94,285
1962	15,492	14,048	95,178
1963	17,816	16,113	96,156
1964	20,239	18,279	97,182
1970	38,739	34,973	103,704
1975	63,600	57,430	108,619+
1977)	— not available —		(111,351++
1980)			(113,265+
1982)			(117,026++

SOURCE: "Demand Trends of Food Products" published by Intercommunications Inc., June 17, 1969.

+SOURCE: Report of National Census (project originated from Ministry of Public Works) in Report on the Japanese Marketing Environment for Processed Food Products — The Market.

++Based on 1 percent annual growth rate from 1971 population of 104.9 million.

Income

Japanese disposable income, like the Gross National Product, has shown remarkable growth in the past 20 years. Table 3 indicates several historical measures of average consumer income and income potential.

Average per capita income rose to about $1,600 in 1972 from $375 in 1960. Real average disposable income has displayed a growth rate similar to that of national income (Table 3).

TABLE 4. ESTIMATED DISTRIBUTION OF INCOME PER HOUSEHOLD (%)

	1958	1964	1970	1975
Under Y 100,000	15.76	4.76	1.53	0.70
Y 100,000 – 200,000	20.20	8.43	2.10	0.91
200,000 – 300,000	21.53	12.49	4.46	2.20
300,000 – 400,000	15.03	13.72	6.51	3.68
400,000 – 500,000	8.65	13.13	7.94	5.04
500,000 – 600,000	4.78	14.56	8.53	6.03
600,000 – 800,000	4.62	15.91	16.42	13.54
800,000 – 1 million	1.67	8.58	13.65	13.24
1 million – 1.5 million	1.76	8.25	21.01	24.95
1.5 million – 2.0 million	1.76	2.36	9.29	13.45
2.0 million and over	1.76	1.80	8.56	16.26

SOURCE: Bureau of Statistics, Office of the Prime Minister (Japan) as appeared in C. D. Caldwell, "Demand Trends of Consumer Products in Japan". Canadian Embassy, Tokyo.

In 1970, about 39 percent of Japanese households were in the million yen and over income category (about $3,000 and over). By 1975, it is anticipated that this will reach 45 percent[7], resulting in an increase in the number of households which will become meat consumers.

An important phenomenon in the consumption of meats is that as incomes increase, and new families move into higher income brackets, there are new consumers for red meats. This is somewhat the opposite to the case of eggs and fish which have been more familiar to all income levels.

Income elasticity of demand is estimated to be 0.47, implying that a 10-percent change in consumer disposable income results in about a five-percent change in the household consumption of pork. Comparable estimates for Canada range from .005 to .25[8]. This relatively high income elasticity supports the contention

[7]Bureau of Statistics, Office of the Prime Minister, see Table 4.

[8]Yankowsky, CDA, (1970) and Reimer and Kulshreshtha, University of Saskatchewan, (1974) respectively.

that increasing real economic growth in Japan will support increased pork consumption. However, should economic growth not be realized, (due to any number of factors associated with the current energy situation, world inflation, trade agreements, etc.), growth in pork consumption and the Japanese market would correspondingly stagnate or decrease.

Price

It is estimated that the price elasticity of demand for pork (annual) in Japan equals -1.089. This compares to estimates for Canada of -0.47 and -.8024[9]. This means that a one-percent change in the retail price of pork in Japan results in about a one-percent change in the quantity consumed or a unitary elasticity of demand. The implications of this relationship between price and consumption are that increasing consumption levels could be dampened to some degree by world price increases of recent magnitudes.

Earlier estimates of the price elasticity of demand for pork reflected an elastic demand (-1.47)[10]. This estimate, based on the 1953-68 period, perhaps serves to indicate a changing quantity/price relationship for pork[11].

Pork Substitutes

The relatively high price of beef in Japan, as well as projections of its production, render it a poor substitute at the present time. The land constraint is an obvious prohibitant to extensive Japanese beef production.

Quantitative estimates of the demand function for pork failed to show beef consumption or beef price as having a significant influence upon changes in annual pork consumption.

Fish, long an important source of protein in the diets of consumers at all income levels, is unlikely to change its position as a substitute. Furthermore, the fishing industry and fish supplies are not expected to show much growth in future years. Fish consumption and price, like that of beef, was not found to be statistically associated with annual pork consumption in estimates of pork demand relationships[12].

Poultry meat was the only potential substitute for which a significant relationship could be perceived. Changes in the price of pork relative to the price of poultry meat should then be expected to influence the substitution of poultry for pork in the Japanese diet. The competitive advantage of the production of poultry (lower feed conversion and less polluting waste) may render poultry meat a serious contender for the Japanese consumer's meat dollar.

Lamb and mutton, almost all imported, are not expected to be important influences in the growth of pork consumption.

Per Capita Consumption Projections

Pork consumption per capita has increased some 8 pounds in the past eight years, but is still far below that of other pork eating countries. Estimates associated with "target" production levels issued by the Japanese Ministry of Agriculture and Forestry (1972) indicate that consumption could be in the area of 27 pounds per capita by 1977 and 32 pounds (carcass basis) by 1982. These levels, for example, would still be much less than Canada's current level.

Aggregate consumption figures for the past eight years have grown by some 623 thousand metric tons. 1982 projections are for 1,670 thousand metric tons[13]. Other estimates place consumption at 1,370 thousand metric tons by 1980[14]. Consumption in 1982 is expected to be about 770 thousand metric tons or about 16 pounds per capita.

With a population of 1,204 million people, a 1-pound per capita change in consumption results in a 55-thousand ton change in aggregate consumption, which is nearly equal to the 1972 total imports of pork and is about twice Canada's exports of pork to Japan in that year.

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[9] Ibid.

[10] Filipello, A., A Dynamic Econometric Investigation of the Japanese Livestock Economy, Ph.D. Dissertation, 1968, University of Missouri, Table 4.

[11] Estimates of the price elasticity of demand for pork using quarterly data for the period 1969-73 indicate a much more inelastic demand (own price elasticity = -0.26). This method, of course, allows for seasonal variation in consumption and price and reflects a more current time period. It implies that consumption is currently influenced to a much lesser degree by price than that implied by the elasticity estimate based on annual data for the longer time period.

[12] One possible reason for the absence of statistically significant relationships between expected substitutes and pork could be an inability to properly account for the influence of the pork stabilization policy on price.

[13] Outline of Projections for Production and Demand for Agricultural Products for 1982, Ministry of Agriculture and Forestry. October 1972 (Provisional).

[14] *Spot News from Abroad*, No. 35, August 31, 1973, p. 2.

Projected Demand

Projections for 1975 and 1980 have been made assuming that those relationships, which explain about 95 percent of the variation in annual household pork consumption for the period 1953 to 1972, will hold for the near future. Assumptions associated with these factors which are determined outside of the model used are: (1) a per capita disposable income of Y73,138 and Y87,190, for 1975 and 1980[15]; and (2) average 1953-72 deflated retail pork price levels.

The projections are for a per household pork consumption (carcass basis) of 20.7 pounds for 1975 and 23.5 pounds for 1980.

Based on projected 1975 and 1980 populations of 108.6 and 113.3 million[16], these per capita projections imply total consumption levels of 1,022 thousand and 1,211 thousand metric tons for these years.

Table 5 summarizes historic and consumption projections for purposes of comparison.

FUTURE JAPANESE IMPORT REQUIREMENTS

Assuming that the liberalization of Japanese pork trade continues in some form similar to the past few years, projections of consumption and production can provide indications of import requirements. Table 6 displays projected import requirements for Japan based upon the supply-demand relationships already identified. Both the Japanese Ministry of Agriculture and Forestry and USDA projections are included for comparison purposes. The pork production "targets" of MOAF may be considered optimistic -- they imply Japanese self-sufficiency in pork beyond 1974. The USDA has not yet published projections for Japan based on highly rigorous analyses; it is believed that those referred to here are based largely on Japanese estimates.

Forecasts using the consumption projections listed earlier plus the 1975 and 1980 domestic production of 1,946.8 thousand and 1,426.0 thousand metric tons of pork were made[17]. Pork imports of 90.0 thousand metric tons are forecast for 1975, but in 1980, the projection indicates that Japan will be on an export basis.

[15]Equivalent to 10.0 and 6.0 percent nominal annual growth rates, below recent levels but consistent with current economic conditions in Japan.

[16]"Report of National Census" in *Report of the Japanese Marketing Environment for Processed Food Products - The Market.*

[17]This is based on 1953-72 average values of hog and feed price changes plus linear projections of average pork carcass weight.

These are significantly less than the 1973 estimated imports of 126 thousand metric tons.

While the import projection technique is rather crude and generates a value less than that estimated for 1973, examination of the cyclical pattern of Japanese hog production suggests that the estimates could be feasible. Hence, poor prospects for increased pork imports to the Japanese market are indicated. Which exporters will share this declining market becomes an obvious question.

CANADA'S SHARE OF THE JAPANESE MARKET

Among the major exporters of pork to Japan are the U.S., Australia and Taiwan, in addition to Canada. Many expect that future important exporters will include the People's Republic of China, and the Republic of Korea, with Denmark, Mexico and Norway also receiving some attention. Sweden also entered the market in 1973.

As indicated earlier, the waiving of quotas and import duties caused imports to rise sharply during the latter part of 1972 and the first half of 1973. Table 7 shows pork import increases for the fiscal year 1972-73 compared to 1971-72. The liberalization of pork resulted not only in increased imports (over 100 thousand tons for the period July 1972 to June 1973) but in new entrants into the market. Taiwan, previously exporting only small quantities of processed pork to Japan, has suddenly risen to the second most important source of imported pork, claiming 20.7 percent of the market in value. Canada, on the other hand, increased its export value of pork to Japan by only 74 percent during the past fiscal year, reflecting a declining share of the 200 percent increase in the value of total pork imports. The U.S. and Australia preserved their positions as the other major exporters, increasing the value of their exports by 153 and 677 percent respectively.

In terms of volume, Canada's share declined from 35.9 percent of the market in 1971-72 to 20.6 percent in 1972-73. The U.S. share also declined, but only from 47.3 percent to 38.9 percent, still high enough to represent the largest share. Taiwan, on the other hand, showed mammoth gains rising from 3.4 percent of the total volume of the Japanese import market to 22.1 percent. Australia likewise improved its share from 4.7 percent to 15.6 percent during the past fiscal year.

SUMMARY

Japan, while a small per capita pork consumer, has become a major pork importer, importing about 126

TABLE 5. JAPANESE PORK CONSUMPTION AND PROJECTIONS FOR 1975 TO 1985

Year	Consumption Carcass Weight	Per Capita Consumption	Percent Increase From Previous Year	Source of Projection
	'000 M/T	lb./capita	%	
1955	82.5	0.9	–	
1960	153.2	3.6	–	
1965	363.6	8.1	–	
1970	665.3	14.1	–	
1971	776.9	16.3	16.8	
1972	837.4	17.2	7.8	
1973 est.	966.0	n.a.	n.a.	
1975	1,022.0	20.7		This study.
1977	1,364.0	22.0		Japanese M.O.A.F.[1]
1980	1,211.0	23.5		Author
1980	1,370.0	27.0		USDA[2]
1982	1,670.0	25.0		Japanese M.O.A.F.
1985	2,125.0	less than 20 at population of 114 million		USDA[3]

[1] Japanese Ministry of Agriculture and Forestry.
[2] As reported in Spot News from Abroad, No. 35, Aug. 31, 1973, p. 2.
[3] A. S. Rojko, "Future Prospects for Agriculture Exports", USDA, ERS, August 1973, preliminary.

thousand metric tons in 1973 or about 15 percent of domestic requirements.

Population growth, a major determinant of future import requirements, is expected to increase about 10 to 115 million over the next decade. Substantial economic growth is also expected to provide for increased pork demand. While a changing diet and a growing consumer movement has also influenced pork import levels, little evidence of competition from other sources of animal protein is apparent. There are some indications that the demand for pork is becoming less price elastic. Projections for 1980 indicate a growth in consumption to an optimistic 27 pounds per capita. Although the Japanese government expects this will all be produced domestically, there are several growing restrictions to production in Japan. Most important among these are constraints associated with the problem of pollution

TABLE 6. JAPANESE IMPORT REQUIREMENTS 1971-73 AND PROJECTIONS FOR 1975-85

Year	Production	Consumption (Carcass Weight)	Net Imports	Net Imports Per Capita
	'000 M/T	'000 M/T	'000 M/T	(carcass weight) lb.
1971	749.7	776.9	27.2	.57
1972	769.4	837.4	67.9	1.39
1973 est.	840.0	966.0	126.0	2.60
1975[1]	946.0	1,022.0	76.0	1.54
1977[2]	1,364.0	1,364.0	nil	nil
1980[1]	1,426.0	1,211.0	nil	nil
1980[3]	1,548.0	1,370.0	nil	nil
1982[2]	1,670.0	1,670.0	nil	nil
1985[4]	2,125.0	2,125.0	nil	nil

[1] Projected by this study.
[2] Projected by Japanese Ministry of Agriculture and Forestry, op. cit.
[3] Projected by USDA, op. cit. with Japanese production projection.
[4] Projected by USDA, Rojko, op. cit.

TABLE 7. JAPAN: IMPORTS OF PORK – JULY-JUNE 1971-72 AND 1972-73.

Country of Origin	Unit	Quantity 1971-72	Quantity 1972-73	Quantity Change	Value, c.i.f. 1971-72	Value, c.i.f. 1972-73	Value Change	Unit Value 1971-72	Unit Value 1972-73	Unit Value Change
		000's	000's	%	$'000[1]	$'000[2]	%	$U.S.	$U.S.	%
United States	kg.	23,754	40,605	+ 71	27,518	69,623	+153	1.16	1.71	+ 47
Taiwan	kg.	1,696	23,035	+1,258	5,115	40,052	+683	3.02	1.75	– 42
Canada	kg.	18,053	21,543	19	25,328	44,026	+ 74	1.40	2.04	+ 46
Australia	kg.	2,355	16,258	+ 590	2,616	20,319	+677	1.11	1.25	+ 13
All Other	kg.	4,355	2,936	-33	3,988	19,546	+390	.92	6.66	+724
Total	kg.	50,213	104,377	+ 108	64,565	193,566	+200	1.29	1.85	+ 43

[1] Y 325 per dollar U.S.

[2] Y 290 per dollar U.S.

SOURCE: Japan Customs Bureau

from animal waste and the dependence upon imported feed.

Pork imports, once under quota, are restricted by tariffs which are tied to the domestic stabilization price. At times when the domestic price of pork is high and supplies are short the import duty is temporarily waived.

Some progress in the desire to become more self-sufficient is apparent. This trend may be expected to continue during the next decade. While this supports the forecast that a decrease in imports of pork will occur, projections based on historic trends and relationships should be regarded cautiously. Considerably more information and analysis is required, especially to ascertain to what degree the supply-demand relationships are changing over time. Notwithstanding the limitations of models which use the past to predict the future, a more detailed model of the entire feed-livestock-meat sector, considering seasonal influences, would be useful.

Assuming a continuation of Japan's import diversification policy, it is unlikely that any one exporter will gain a significantly larger share of the Japanese market than other major exporters. This implies that if pork import requirements decline, as projected by this preliminary analysis and others, Canada's pork exports to Japan will decline accordingly.

POLICY AND PROGRAM DEVELOPMENTS

CANADA GRAIN ACT

The regulations under the Grain Act have been changed by four recent amendments. Only the briefest summary can be given here. For full texts, see Canada Gazette, Part II, 1974, June 26 (item a), August 14 (items b, c, d).

(a) New rates for elevation and storage under Schedule D, effective June 1, 1974, were set in the May 30 amendment. Elevation rates for all grains in and out were set at $28.75 per 1,000/bu. at Georgian Bay and lake transfer ports, and at $25.75 per 1,000/bu. at St. Lawrence and Atlantic ports. Storage rates, including insurance, were set at 1/20 cent per bu. at all ports. (PC 1974-1191 May 30)

(b) A 50-percent increase across the board for Grain Commission services (inspection, sampling, analysis, weighing, etc.) was established by the complete amendment of Schedule A, effective November 1, 1974. (PC 1974-1703 July 30)

(c) New maximum tariffs at primary elevators, effective August 1, 1974, were established by the revision of Schedule B of the Regulations. The former maximum of $3^3/_4$ cents per bu. for wheat, barley, rye, corn, and $3^1/_2$ cents for oats (6 cents for flaxseed, rapeseed and mustardseed) covering receiving, elevating, storage for 10 days, insurance, delivery to rail cars, etc., was raised to $10^1/_2$ cents per bu. for all grains. The new maximums included provision for handling charges formerly incorporated in special agreements negotiated by the licensees with the Canadian Wheat Board. The rates were intended to give elevator operators flexibility to vary their tariffs as desired. (PC 1974-1702 July 30)

(d) Maximum tariffs for terminal elevators were increased, effective August 1, by a revision of Schedule C of the Regulations. Elevation tariffs at all ports went up as follows (with previous tariffs in brackets): wheat, oats, barley, corn, to $4^7/_8$ cents per bu. ($4^3/_8$) -- rye $5^3/_8$ ($4^3/_8$) -- flaxseed $6^3/_8$ ($5^7/_8$) -- and rapeseed and mustardseed $7^3/_8$ ($6^7/_8$). Storage rates on all grains at all ports remained unchanged at 1/30 cent per bu. (PC 1974-1702 July 30)

PRAIRIE GRAIN ADVANCE PAYMENTS ACT (Canadian Wheat Board)

(Amendment to Advance Payments Regulations)

This amendment changed Section 16 of the Regulations to state that the Wheat Board in the 1973-74 crop year could make an emergency payment to a producer for that crop year as an advance on the initial payment for unthreshed grain, provided application was made before June 1, 1974. (PC 1974-978 April 30)

CANADIAN WHEAT BOARD ACT

(Amendment to Regulations)

Section 34 (under Part 4, concerning regulation of interprovincial and export trade in wheat) dealt with the documents required, licences for export, import and transport, etc. As amended, this section now states only that the Wheat Board shall sell its feed grain at competitive prices in domestic and export markets, in consultation with the Livestock Feed Board. (PC 1974-1173 May 22)

AGRICULTURAL PRODUCTS CO-OPERATIVE MARKETING ACT

(Wheat Agreement with Ontario)

This agreement set the initial payment to producers at $2.01 per bushel for the 1974-75 crop year. Handling costs are not to exceed an average of $34^1/_2$ cents per bushel. If the wholesale price is less than the initial payment plus handling costs, the Ontario Winter Wheat Producers' Marketing Board receives the amount by which the initial payment with handling costs exceeds the wholesale price.

The Board must give the Minister monthly reports on the total quantity of wheat delivered and sold. (PC 1974-1406 June 20)

CROP INSURANCE ACT

(Agreement with Ontario)

This amendment to the Ontario agreement provides for changes in coverage and rates designed to keep the

insurance scheme self-sustaining; for inclusion of coloured beans, tobacco, hay, pears, sweet and sour cherries as insurable crops; and for inclusion of new Schedules A, C, D, E, H, I, J, K, O, P, U, V, W, X and Y. Under the Agreement Canada pays 50 percent of the premiums and the farmer pays the remaining 50 percent, providing Ontario pays all administrative costs. (PC 1974-1407 June 20)

TWO-PRICE WHEAT PROGRAM

This program, introduced in the fall of 1973, remains in effect despite the fact that the bill embodying it was shelved when Parliament was dissolved in May. The program, which applies to all Canadian farmers, established a seven-year guaranteed floor price of $3.25 per bushel for top-grade milling wheat sold within Canada. When the world price goes above $3.25, Canadian consumers will be subsidized, with the government paying the difference to a maximum of $5.00 a bushel.

The purpose of the program, as re-stated by the government on May 3, is "a measure to help keep down the cost of bread by freezing the price of bread wheat to millers at a maximum of $3.25 per bushel."

On durum, the government pays up to $1.75 a bushel for a total possible domestic durum price to the Wheat Board of $7.50 a bushel. This will ensure that domestic users will pay no more than $5.75 a bushel for durum wheat.

The program is administered by the Wheat Board in the West, and in Ontario by the Ontario Winter Wheat Producers' Marketing Board.

NEW CROP DEVELOPMENT FUND

As announced by Agriculture Minister Whelan, Agriculture Canada put into operation a one-million dollar New Crop Development Fund on June 28. The money will be used to stimulate, develop and adapt new crops and new varieties. Those eligible for assistance will include provincial government agencies, universities, producer groups and commercial organizations. Among uses of the funds would be development of new high protein crops or new high energy cereals.

NEW FEED GRAINS POLICY

Effective August 1, 1974, a new feed grains policy was initiated by the Minister of Agriculture and the Minister responsible for the Canadian Wheat Board. The policy provides for a national market for feed grains, assurance of supplies for the domestic market with prices established by full interplay of price and demand, a price guarantee to feed grain producers for non-Board sales, co-ordination of transportation and stocks, a reserve stock at Thunder Bay, etc.

ANIMAL CONTAGIOUS DISEASES ACT

(Amendment to Regulations)

Section 1560 of the Regulations under the Act is changed to provide that compensation paid for cattle slaughtered to eradicate disease shall not exceed $450 for purebreds and $200 for grade animals. (PC 1974-664 March 26)

MEAT INSPECTION ACT

(Amendment to Regulations)

(a) The latest amendment affecting hours of inspection services provided by the Department (Sections 12 and 13) reinstates the status quo: up to $8^1/_2$ hours of inspection duty per day, up to 40 hours per week, ending at 6 p.m. on Fridays for veterinary inspectors, and at 12 p.m. on Saturdays for others (i.e. lay inspectors). (PC 1974-1288 May 30)

(b) Other sections of the Act (notably 6, 7, 12, 13, 14, 65, 76 and 87) are still being revised and amended.

HOG STABILIZATION PLAN

On June 11 the Agricultural Stabilization Board issued a set of answers to concerns that had been expressed about the hog stabilization plan announced May 22.

The Board made the following points: The plan is intended to be a stop-loss program; and the guaranteed margin does not allow producers to ignore market supply and demand. It is not intended to cover normal short-term market losses, but to prevent certain long-term losses. Payments to producers under the plan are identical across Canada. All costs (e.g. producing weanling pigs) are included in the guaranteed margin. The plan is based on practices available to serious hog producers anywhere. Feed calculations are based on wholesale prices because they are more reliable indicators of feed costs than retail prices.

BEEF POLICY CHANGES

On August 2, Agriculture Minister Whelan announced a new beef stabilization program, effective August 12, which provides a price support of $45.42 per cwt. on all slaughter cattle grading A, B and C. It is based on 90 percent of the past five-year national average for A1 and A2 cattle, plus anticipated changes in input costs as

measured by the Farm Input Price Index. This interim plan will run until August 11, 1975.

The Minister also announced that there would be an annual quota of 82,835 head on live beef cattle imported for slaughter, and 125.8 million pounds of fresh and frozen dressed beef and veal. This applies also until August 11, 1975. Also announced was a decrease in the beef premium to 2 cents from August 12-17 and to 1 cent from August 19-24. It was then dropped entirely.

FARM PRODUCTS MARKETING AGENCIES ACT

(a) Interim Egg Levies Order

In Section 10 of Part 2 of the Schedule of the Egg Marketing Agency Proclamation, the word "interim" is added to the title of the Order. Under Subsection 3(1) the levy imposed on each producer is 1 cent per dozen. (SOR/74-207 April 1)

(b) Canadian Turkey Information Regulations

These regulations require producers of turkeys for interprovincial and export trade to keep complete, accurate books and records of production and marketing, and to make this information available to the Turkey Marketing Agency. (SI/74-70 June 12)

(c) Canadian Turkey Marketing Levies Order

To implement the turkey marketing plan, this order empowers the Turkey Marketing Agency to fix and collect levies on turkey marketing. (SOR/74-379 June 21)

(d) Amendment to Canada Egg Purchasing Levies Order

This amendment fixes the expiry date of the Order: October 12, 1974. (SOR/74-393 July 2)

AGRICULTURAL PRODUCTS MARKETING ACT

(Amendment to Quebec Milk Marketing Levies (Carnation) By-law)

The amended subsections 3 (1) and (2) of the by-law now establish under-quota rates of 15 cents for each 100 pounds of milk or $0.0429 for each pound of butterfat, and above-quota rates of $1.50 for each 100 pounds of milk or $0.4286 for each pound of butterfat. These levies are payable to the Quebec Carnation Company Milk Producers' Board. (SI/74-78 July 10)

AGRICULTURAL STABILIZATION ACT

(Manufacturing Milk and Cream Stabilization Order)

This order of July 30 set the prescribed price for manufacturing milk at 224.9 percent of the base price. The Agricultural Stabilization Board is to make payments to the Canadian Dairy Commission amounting to $323 million between April 1, 1974 and March 31, 1975. (PC 1974-1701 July 30)

CHANGE IN DAIRY POLICY

On August 1, Agriculture Minister Eugene Whelan announced that producer returns for manufacturing milk (under market-sharing quotas) would be increased by 91 cents per cwt. from a target price of $8.50 to $9.41. Of this, 26 cents would be direct subsidy, retroactive to June 1, bringing the total subsidy to $2.56 per cwt. (73.14 cents per lb. of butterfat). The rest of the increase will come from higher support prices for butter which will go up 8 cents to 85 cents, and skim milk powder, up 4 cents to 54 cents, both effective August 1. The increase was made to improve producer returns and to halt sagging milk production.

AGRICULTURAL PRODUCTS CO-OPERATIVE MARKETING ACT

(Beans Agreement with Ontario)

This agreement between the federal Minister of Agriculture and the Ontario Bean Producers' Marketing Board, dated June 20, was designed to assist in the marketing of the 1974 crop. The initial payment to the Board of $7.06 per cwt. was approximately 72 percent of the three-year average price to producers.

The agreement, which is effective until December 31, 1975, covers quality and grades of beans to be marketed, initial payments to producers and processors, marketing requirements, carrying and processing costs, wholesale prices, appointment of auditors, settlement of disputes, etc.

The Board agrees to market Ontario beans containing not more than two percent damage or not more than 18 percent moisture. Marketing is to be handled by two pools, one for No. 1 Canada Eastern Yellow-eye Beans and one for No. 1 Canada Eastern Pea Beans. Primary producers are to receive an initial payment of $7.06 per cwt.

If the wholesale price (the actual amount received by the Board on bean sales) is less than the initial payment plus

carrying and processing costs, the Board is paid the amount by which the initial payment and the other costs exceed the average wholesale price.

Carrying costs must not exceed an average of 35 cents per cwt. Processing costs are not to exceed an average of $1.40 per cwt. for pea beans and $2.50 per cwt. for yellow-eye beans.

The Board is to give the Minister a monthly report on total quantities of beans delivered and sold. (PC 1974-1455 July 20)

FINANCIAL ADMINISTRATION ACT (Minister of Finance and the Treasury Board)

(Dried Beet Pulp and Corn Choppings Remission Order)

Between September 1, 1973 and August 31, 1974, customs duties were remitted on dried beet pulp and corn choppings imported into Canada for use as animal feed. (PC 1974-1419 June 20)

(Grain Trailers and Tractors Remission Order)

Customs duties and excise taxes were remitted on trailers and tractors leased and temporarily imported between April 4 and July 31, 1974, by individuals or organizations situated in Canada. The same applied to trailers and tractors temporarily imported during that period by U.S. truckers to haul grain in Canada. Trailers and tractors thus temporarily imported were to be exported not later than August 10, and might not be re-imported. (PC 1974-1441 July 10)

AGRICULTURAL PRODUCTS MARKETING ACT

(Amendment to B.C. Fruit Export Regulations)

By the amendment to Section 3, the Regulations now apply to the marketing of regulated products in interprovincial and export trade and to people and property within British Columbia. (SOR/74-205 March 28)

VETERANS' LAND ACT

(Veterans Affairs Department)

(a) In a public announcement by the Veterans Affairs Department in June, the deadline for financial assistance under the Act was extended to March 31, 1975, for all veterans who had qualification certificates on October 31, 1968. Applications for loans are to be made through field officers of the Veterans' Land Administration.

(b) *Amendment to Veterans Land Regulations*

This amendment, dated June 6, removed a section of the regulations covering husbands and wives. This section stated that: (1) where a husband and wife both held certificates qualifying them to claim financial assistance under the Act, only one certificate could be used at any one time; and (2) where husband and wife were legally separated, and both were qualified veterans, and the Regional Director was satisfied that there was no collusion, both might use the benefits of the Act. The revoking of these specific regulations permits the Regional Director to use his own discretion in allowing a grant of financial assistance.

(c) On March 26 the interest rate on Part 3 loans was increased from 7 percent to $8^1/_4$ percent, effective to September 30, or until further notice.
(PC 1974-1327 June 6)

PUBLICATIONS

Readers: in ordering publications, use the addresses as shown.

ECONOMICS BRANCH PUBLICATIONS

Available from the Economics Communications Unit, Agriculture Canada, Ottawa, K1A 0C5

Prairie Regional Studies in Economic Geography, No. 16, The Bassano Region of Alberta. H.R. Fast, D.A. Neil. 74/3, March, 1974.

Food Consumption Patterns in Canada. Z.A. Hassan, W.F. Lu. Tables, graphs. 98p. Pub. No. 74/8.

Discussion Paper On: The Socio-Economic Adjustment Process of Ex-industrial Milk and Cream Producers in Ontario and Quebec. A. Herscovici. A Federal Employment Stimulation Program. Montreal. June 1974. Tables, maps. 118p. Pub. No. 74/9.

Selected Agricultural Statistics for Canada. 110p. July 1974. Pub. No. 74/10.

Marketing Boards in Canada, 1972 and 1973. J.M. Sullivan. Pub. No. 74/11.

Canada's Trade in Agricultural Products, 1972 and 1973. D.L. Bolton. Pub. No. 74/12.

Seasonal, Cyclical and Trend Variations in Hog Prices and Numbers Slaughtered. T.M. Petrie. Pub. No. 74/13.

AGRICULTURE CANADA

Available from the Information Division, Agriculture Canada, Ottawa, K1A 0C5

Dairy Produce Market Report, weekly. Bilingual. Vol. 49, No. 26, week ending June 29, 1974. Free. Cat. No. A77-7/49-26.

Agriculture Abroad. Bi-monthly digest of agricultural policies and programs in various countries. Issued by the International Liaison Service, Canada Department of Agriculture, in co-operation with the Trade Commissioner Service, Department of Industry, Trade and Commerce. Processed. 28cm. Paper cover. Vol. 29, No. 3, June 1974. 49p. Contents - Highlights. - Country reports: Argentina; Britain; Japan; West Germany. - European Economic Community. - Canada's Development Assistance Programs. - U.S. Dairy Industry Developments. - Australia Hog Industry. - Developments in Soviet Poultry Industry. - Land Tenure in Denmark. Free. Cat. No. A77-3/29-3.

Crop and Seasonal Price Summaries. Prepared in the Markets Information Section, Production and Marketing Branch. 30cm. Bilingual. Vol. 26, 1972-73. Part I: *Fresh and processed fruits and vegetables; maple products and honey.* 31p. Vol. 26, 1972-73. Part II: *Fresh and processed fruits and vegetables.* 50p. Free. Cat. No. A77-12/26-2.

System of Soil Classification for Canada. Ottawa, revised 1974. Ring binder. Colour illus., tables, figs. 23cm. (Publication 1455). $5 per copy. Cat. No. A42-4074.

Growing Corn. Ottawa, revised, 1974. 23p. Illus., tables. 23cm. (Publication 1025). Free. Cat. No. A53-1025.

Guidelines for Feeding Potato Processing Wastes and Culls to Cattle. J.W.G. Nicholson. Ottawa, 1974. 17p. illus., tables. 23cm. Paper cover. (Publication 1527.) Prepared in the Research Station, Fredericton, N.B. Free. Cat. No. A53-1527.

Common and Powdery Scab of Potato. C.H. Lawrence, Research Station, Fredericton, N.B. Ottawa, 1974. 7p. Figs. 23cm. Paper cover. (Publication 1530). This publication replaces Publication 953, Common Scab of Potato. Free. Cat. No. A53-1530.

Agriculture Canada Headquarters. Ottawa, 1974. Illus. 22cm. Paper cover. Bilingual. Free. Cat. No. A22-81/1974.

Pesticide Research Report, 1973. Compiled by the Canada Committee on Pesticide Use in Agriculture. Ottawa (1974). 426p. Tables. 28cm. Processed. Paper cover. Free. Cat. No. A41-14/1973.

Black Flies. F.J.H. Fredeen. Ottawa, 1973. Reprinted, 1974. 19p. Illus., table. 23cm. Paper cover. (Publication 1499). Prepared in the Research Station, Saskatoon, Saskatchewan. This publication replaces publication 940, Control of Black Flies in Canada, issued in 1955. Free. Cat. No. A43-1499.

Pruning Manual. Ottawa, 1973. Reprinted, 1974. 15p. Illus. 23cm. Paper cover. (Publication 1505). Prepared in the University of Alberta and published by the Canada Department of Agriculture under the provisions of the Federal-Provincial Regional Coordinating Committees on Agricultural Publications. Free. Cat. No. A53-1505.

Storing Bulbs. Ottawa, revised, 1974. 7p. Table. 23cm. (Publication 1276). Free. Cat. No. A53-1276.

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STATISTICS CANADA PUBLICATIONS

Available from the Publications Distribution Unit, Statistics Canada, Ottawa, K1A 0T7

Tobacco and Tobacco Products: Production and Disposition of Tobacco Products, Vol. 3, No. 4, March, 1974. Bilingual. (Service Bulletin). $1.40 per year. Cat. No. CS32-022.

Leaf Tobacco Acreage, Production and Value, 1973. Ottawa, 1974. 3p. Tables. 28cm. Bilingual. Prepared in the Manufacturing and Primary industries Division. 35¢ per copy. Cat. No. CS22-205/1973.

Production of Poultry and Eggs, 1973. Ottawa, 1974. 23p. Tables, charts, 28cm. Paper cover. Bilingual. Prepared in the Agriculture Division. 70¢ per copy. Cat. No. CS23-202/1973.

Canned and Frozen Processed Foods, 1972-1973. Ottawa, 1974. 7p. Tables. 28cm. Bilingual. Prepared in the Manufacturing and Primary Industries Division. 35¢ per copy. Cat. No. CS32-212/1972-73.

Dairy Statistics, 1973. Ottawa, 1974. 23p. Tables, charts. 28cm. Paper cover. Bilingual. Prepared in the Livestock Animal Products Section, Agriculture Division. 70¢ per copy. Cat. No. CS23-201/1973.

Field Crop Reporting Series, 1974. Telegraphic crop report - Prairie Provinces. 30¢ per copy. $5.60 for series of 20 reports. Cat. No. CS22-002.

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Fruit and Vegetable Preservation: Pack of Frozen Fruits and Vegetables as Reported up to the End of May, 1974. Vol. 3, No. 6, July, 1974. Bilingual. (Service Bulletin). $1.40 per year. Cat. No. CS32-023.

Fruit and Vegetable Preservation: Acquirements of Fresh Fruits and Vegetables, April 1, 1973 to March 31, 1974 from 1973 crop. Vol. 3, No. 7, July, 1974. Bilingual. (Service Bulletin). $1.40 per year. Cat. No. CS32-023.

Fruit and Vegetable Preparations. Vol. 12, No. 1, quarter ended March 31, 1974. Bilingual. 35¢ per copy, $1.40 per year. Cat. No. CS32-017.

Grain Milling Statistics. March, 1974. Bilingual. 30¢ per copy, $3 per year. Cat. No. CS32-003.

Wheat Review. Vol. 44, No. 11, June, 1974. Bilingual. 40¢ per copy, $4 per year. Cat. No. CS22-005.

Selected Dairy By-products: Production and Inventory of Process Cheese. Vol. 3, No. 12, June, 1974. Bilingual. (Service Bulletin). $1.40 per year. Cat. No. CS32-024.

Selected Meat and Meat Preparations. Vol. 6, No. 3, March, 1974. Bilingual. 15¢ per copy, $1.50 per year. Cat. No. CS32-020.

Pack, Shipments and Stocks of Selected Canned Fruits and Vegetables. Vol. 41, No. 3, March, 1974. Bilingual. 30¢ per copy, $3 per year. Cat. No. CS32-011.

Dairy Factory Production. Vol. 43, No. 5, May, 1974. Bilingual. $1.50 per year. Cat. No. CS32-002.

Farm Implement and Equipment Sales. Vol. 16, No. 5, July, 1974. Bilingual. $1.50 per year. Cat. No. CS63-009.

Stocks of Dairy and Frozen Poultry Products. Vol. 57, No. 6, June, 1974. Bilingual. 30¢ per copy, $3 per year. Cat. No. CS32-009.

Stocks of Fruit and Vegetables. Vol. 38, No. 5, May, 1974. Bilingual. 30¢ per copy, $3 per year. Cat. No. CS32-010.

Fluid Milk Sales. Vol. 28, No. 5, May, 1974. Bilingual. $1.50 per year. Cat. No. CS23-002.

Dairy Review. Vol. 35, No. 5, May, 1974. Bilingual. 40¢ per copy, $4 per year. Cat. No. CS23-001.

Index of Farm Production, 1973. Ottawa, 1974. 4p. Tables. 28cm. Bilingual. 35¢ per copy. Cat. No. CS21-203/1973.

Farm Cash Receipts, 1973. Ottawa, 1974. 14p. Tables. 28cm. Paper cover. Bilingual. Prepared in the Farm Income and Prices Section, Agriculture Division. 70¢ per copy. Cat. No. CS21-201/1973.

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Farm Net Income, 1973. Ottawa, 1974. 13p. Tables. 28cm. Paper cover. Bilingual. Prepared in the Farm

Income and Prices Section, Agriculture Division. 70¢ per copy. Cat. No. CS21-202/1973.

Tobacco Products Industries, 1972. Ottawa, 1974. 14p. Tables. 28cm. Paper cover. Bilingual. (Annual Census of Manufactures). Prepared in the Manufacturing and Primary Industries Division. 70¢ per copy. Cat. No. CS32-225/1972.

Oilseeds Review. Vol. 4, No. 4, June, 1974. $1.05 per copy, $4.20 per year. Cat. No. CS22-006.

Fruit and Vegetable Crop Reports, 1974. No. 2. - Canadian mushrooms growers survey, 1973. Published June, 1974. Bilingual. $1.40 for the series. Cat. No. CS22-003.

Coarse Grains Review. Vol. 33, No. 3, May 1974. Bilingual. $1.05 per copy, $4.20 per year. Cat. No. CS22-001.

Selected Dairy By-products: Production and Inventory of Instant Dry Skim Milk Powder. Vol. 3, No. 11, June, 1974. Bilingual. (Service Bulletin). $1.40 per year. Cat. No. CS32-024.

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Trends in Regional Livestock Mix in Ontario and Projections for 1980 - An Application of Hierarchical Analysis. Working Paper AE/74/2. January 1974. L. Martin, H.A. Hedley, and J.B. Stackhouse. 61p. School of Agricultural Economics and Extension Education, Ontario Agricultural College, University of Guelph, Guelph, Ontario.

Financial Alternatives in Purchasing or Leasing a Tractor. Working Paper AE/73/4. February 1974. 50p. R. Batterham and D. Blonde. Ontario Agricultural College, University of Guelph, Guelph, Ontario.

IN REPLY

In the June 1974 issue of Canadian Farm Economics, authors' responses to comments on articles in earlier issues were promised. Here they are:

R.A. McGillivray of Regina, in farmer-investments, found the December article on the Role of the Federal Government in Export Market Development too much in the form of an essay. The author suggests that a news release on the subject would be a more convenient source of information for "business-men type farmers", as the writer described himself.

Ann McLean-Bullen, formerly of AERCC, Ottawa, now with Wye College in England, had a question about the same article that has now been answered by the author. "If I were a prospective exporter," she wrote, "I still would not know where to begin my enquiries or whom to ask." Too true, agrees the author; there is no central point for enquiries like that. However, the prospective exporter could begin by making enquiries of the Provincial Departments of Agriculture, of a regional office of Industry, Trade and Commerce, or of an appropriate section of Agriculture Canada (e.g. the Production and Marketing Branch). Suggestions in the letter included: a follow-up article appraising specific federal efforts in the export field (e.g. the Wheat Board), logistics of commodities for export, and a case study related to the article and comparisons with, e.g., the Danish Marketing Board. The author says he would be very happy to help her make the study she suggests but is not aware of any work done along these lines in the last year. Such articles would be useful, he says, but there is the question of priorities in studies by the Economics Branch and in other federal and provincial departments.

IN REPLY TO AUTHORS AND EDITORS REGARDING AUGUST 74 *CANADIAN FARM ECONOMICS*

I have read the following article(s):

(1) Rice-World Situation and Outlook
(2) Economics of Forage Production and Use on Grain-Cattle Farms
(3) An Analysis of Domestic Use and Sales Trends for Canadian Tobacco
(4) The Japanese Hog-Pork Sector: Some Implications for Canadian Pork Exports

My comments are on article number______ .

This article was: not useful ... very useful

1 2 3 4 5 6 7 8 9 10

Because (e.g., The most important economic and social factors were studied. The work was well documented and the conclusions were useful to me).

Beefs Bouquets (Suggestions to authors, publications committee and editors)

My comments may ( ) may not ( ) be used in a future issue of this publication if the editor wishes.

NAME (Please print) . . . . Occupation . . . .

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Please place this sheet in an envelope and address it to:

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CANADIAN FARM ECONOMICS

HON. EUGENE WHELAN, MINISTER — S.B. WILLIAMS, DEPUTY MINISTER

Agriculture Canada

Economics Branch

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Letters from readers: Letters are encouraged and should be addressed to the author or the Managing Editor. Responses . . . comments, suggestions and points of view are important for effective two-way communications. Letters may be used in the following issue of CFE and will be edited prior to publication where necessary.

DIRECT MARKETING OF FRESH FRUIT AND VEGETABLES - A LOOK AT FARMERS' MARKETS IN CANADA*

A renewed interest in the concept of farmers' markets now exists. Programs are being developed to promote and finance new markets, with factors involved in their establishment being carefully considered. Many markets are likely to be located in shopping centres, along controlled access highways, and even in the central core area of some cities.

*Thomas A. Bennett***

INTRODUCTION

"Change" has been the by-word of the fruit and vegetable industry for the last 50 years and more. We have run the gamut of economic and social forces which have forged major shifts in production techniques and location and in marketing techniques and patterns. The forces in this evolutionary process included population growth, rising income levels, increasing urbanization and increasing physical and social mobility. The changes have included such things as increased specialization of production, improvements in farming technology, the development of grower organizations and of more rapid and efficient transportation and communications services. Other important changes were the rise of supermarkets, the development of large purchasing and warehousing operations to serve chains of retail stores, the development of new processed fruit and vegetable products and of packaging of fresh produce.

During this evolutionary period the marketing of fresh fruits and vegetables developed from a system of direct exchange between producer and consumer to a system of exchange involving a complicated marketing channel composed of many types of market intermediaries performing many varied functions. As urban centers grew and production areas further from these centers became existent, direct contact with consumers became more difficult. Farmers' markets were established, therefore, in many urban centers to facilitate direct and more efficient exchange. As urbanization intensified, and as developing retailing establishments required more servicing, some of these markets became wholesale markets and later a few, such as the Toronto Food Terminal, became regional or terminal markets.

Farmers' markets continued to operate, although several forces began to affect their success. Many were old, having been constructed for horse-drawn traffic, and located in, what came to be, the central core of the city. The market and its location from a functional standpoint, therefore, became highly undesirable.

In the 1950's and 1960's, direct marketing at the roadside or at the farm began to gain favor with many consumers and producers. Consumers enjoyed the drive to the country and the country atmosphere of the markets and the connotation of fresh produce. Roadside marketing is still growing in popularity among consumers, and producers in the business are expanding their operations each year.

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*A paper presented at the 71st Annual Meeting of the American Society for Horticultural Sciences in conjunction with the Canadian Society for Horticultural Science, University of Guelph, Guelph, Ontario, Canada, August 13, 1974.

**Thomas A. Bennett is Head of the Horticultural and Special Crops Section, Marketing and Trade Division, Economics Branch, Agriculture Canada, Ottawa, Ontario, Canada.

Not all consumers, however, are lucky enough to live within easy access of a roadside or farm market and not all producers are located in an advantageous position to benefit from a roadside market enterprise. There are other factors also, which may place limitations on the future growth of direct selling at the farm or roadside. One major factor is the expansion of limited access highway networks. Although the construction of a limited access highway may not affect repeat or local customers it will have a direct effect on transient or tourist trade.

Another factor that may have serious repercussions is the cost and availability of gasoline. Although it may be premature to attempt to analyze the effects on consumer shopping patterns, it is highly possible that some restraints will be imposed on family mobility. The development, growth and decline of sectors within an urban area and the continued suburbanization of cities are additional factors forcing change. The establishment of large shopping centers convenient to suburban consumers further influences consumer shopping patterns.

These factors or forces of change can, however, be viewed as new opportunities. The resurgence of the old "farmers' market" concept is, perhaps, a direct result of these changes.

FARMERS' MARKETS IN CANADA

A "farmers' market" is an established market, located in or near a population center, consisting of more than one seller, with definite regulations governing its operation and catering to the sale of produce directly to the consumer and/or the wholesale trade. From a functional sales standpoint there are three categories of farmers' markets: (1) a market on which all operators sell to consumers only; (2) the type on which operators sell at wholesale only; and (3) a divided market with two well-defined areas where operators in one area sell to consumers and operators in the other area sell at wholesale. A variation on the latter is a market with a specified time period for wholesale and retail sales. Each operator leases or rents his "stall" and sells his produce from a stand or truck. The hours per day, days per week and months per year that the market operates, vary greatly. Many growers operate stalls on more than one market.

There are approximately 119 farmers' markets in Canada. The distribution by province is as follows: British Columbia, three; Alberta, 12; Manitoba, three; Saskatchewan, zero; Ontario, 60; Quebec, 30; New Brunswick, three; Nova Scotia, three; Prince Edward Island, three; and Newfoundland, zero. As is to be expected, most markets are found in the traditionally more important horticultural crop producing provinces. The major exception to this generalization is British Columbia, for reasons that will be explained later.

The provinces vary considerably in the general atmosphere in which marketing occurs and in the attitude of governments and the industry toward farmers' markets. Beginning in the West, an examination is made of some of the factors which may influence the organization and operation of farmers' markets and some of the features of selected markets.

British Columbia

British Columbia is one of the most important fruit and vegetable producing provinces in Canada. Roadside marketing in the province is important, with a total value of sales estimated at $6 million. There are only three markets that could be classed as farmers' markets however, and in these the volume of fruit and vegetables sold is small.

The scarcity of farmers' markets in British Columbia is due to several factors. One is a lack of interest by farmers while another is, perhaps, a lack of sponsorship of needed facilities. The most significant factor, however, may be the direct or indirect influence of marketing boards. There are six for fruits and vegetables in the province, several of which have more or less direct control over the marketing of fresh produce. In essence, the producers have delegated the marketing of their produce to the agencies of the marketing boards.

With the recent relaxing of legislation that required producers to market through the agencies, there may be more interest in farmers' markets. One group of fruit growers has established a farmers' market in the Gas Town area of Vancouver.

Alberta

There are 14 farmers' markets in Alberta with several more in the planning stage. Most of these are a direct result of the Provincial Government's influence and assistance.

Two governmental programs in operation are directed specifically to the future development of the horticulture industry in the province. One program, "The Alberta Fresh Vegetable Incentive Program", is intended to sustain and increase fresh vegetable production there. It provides for assistance in the form of incentive grants to market gardeners and commercial fresh vegetable producers who grow carrots, onions, rutabagas, corn,

cabbage and parsnips. To be eligible for the $300 grant a market gardener must grow, harvest and sell all the vegetables from a minimum of two acres of land. These must be sold through "farm gate sales", a farmers' market or on a pick your own basis. Under the commercial growers' program, a grower must be licensed and must sell a minimum volume of the crops he produces. A specified incentive payment, varying by crop, is given to each qualified grower. The payment received by a producer ranges from a minimum of $300 to a maximum of $5,000.

The second program, the "Alberta Market Place" program, provides grants to qualifying organizations and individuals to sponsor farmers' markets. The grants are made through the Alberta Department of Agriculture. As stated by the Department, "it is the desire of the government to develop prestige markets which operate on good business principles and practices, and which feature trade in Alberta farm produce with emphasis on quality."[1]

In 1973, a survey of seven Alberta cities was made by the Alberta Department of Agriculture to ascertain consumers' attitudes towards farmers' markets.[2] The study concluded that, "in the minds of most consumers, farmers' markets have a positive image and a good future." In addition:

1. Consumers like the "farm fresh" products.

2. They also appreciate the opportunity for direct contact with producers and the friendly, personal service.

3. By shopping at farmers' markets, consumers feel they are helping small, independent producers.

To date, about 10 markets have received direct assistance under the Farmers' Market program, with several more to be opened in the future. The Provincial Department of Agriculture has received 63 additional requests for information on farmers' markets and on the Alberta Market Place program. Reportedly, the markets are receiving good support from consumers but they are having some difficulties in getting growers interested.

Saskatchewan

There are no permanent markets in Saskatchewan. However, the province is taking a close look at Alberta's program and is considering a similar one to promote and assist the development of farmers' markets. At the same time they are studying various organizational structures to promote an expansion of vegetable production. An experimental market was organized by the Department of Agriculture and held on four consecutive Sundays at the Regina exhibition grounds this summer. The response was excellent and more full scale markets are anticipated in the future.

Manitoba

There are three farmers' markets in Manitoba. One, located in Winnipeg, is owned by a growers organization. It was established in 1940 and now has 20 to 30 grower participants. The second, also located in Winnipeg, is the result of a community project. The market is quite successful, operating on Saturday mornings with 20 to 25 growers providing produce. The third, an old market, is in the process of being "revived".

The major interest among producers in the Province appears to be in roadside marketing as their form of direct retail sales. Wholesaling is done through the efficiently operating Marketing Board complex.

Quebec

There are about 30 farmers' markets in the Province of Quebec ranging in size from 8 to 300 operators. Two of the largest markets, one with 300 operators and one with 185, are located in the outskirts of Montreal. They were established in 1925 and 1932. Both markets are owned and run by the city and are open year round. The peak season of operation is from mid-July to mid-September. The markets are open six days a week from 7:00 a.m. to 6:00 p.m. and to 9:00 p.m. on Fridays. On special occasions flowers are sold on Sundays. Facilities include both indoor and outdoor stalls, renting for $5 a day. Most of the operators are growers.

Another large market is located in the downtown area of Quebec City. Established in 1939, it is owned by the city but is administered by a horticultural group. The market is undergoing the usual pressures of the central core of a city and plans are now being made to relocate.

Maritimes

There are about nine markets in the Maritime region – three each in Prince Edward Island, Nova Scotia and New Brunswick. There are none in Newfoundland, although there is some thought of establishing one.

One of the oldest markets in the country, established in 1860, is located in P.E.I. There is a very interesting

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[1] Alberta Department of Agriculture, *Alberta Market Place*, Unpublished Paper. May 8, 1973.

[2] Alberta study, Alberta Department of Agriculture, "Farmers' Market Survey", Unpublished Study. 1973.

The Kitchener Farmers' Market

market in Nova Scotia in a skating rink and operates two or three days a week during the summer. It is operated by a community committee.

Ontario

About one half of the farmers' markets in Canada are located in Ontario. These are distributed throughout the province, although the greatest concentration is in or near the Toronto region. Approximately 10 have been established within the last three years. Although a few of the markets are located on the premises of shopping plazas, most are located on city owned property. All three types are found in the province, with a wide range of operating periods and organizational structures.

Four of the most noted markets in the province are the Kitchener Farmers' Market, the Byward Market, the Toronto Food Terminal and the Queen Elizabeth Way Markets.

The Kitchener Farmers' Market

The Kitchener Farmers' Market is believed to be the largest farmers' market in Ontario and one of the largest in Canada. It is also one of the oldest. In 1830, a monthly market was organized in Kitchener (then Berlin) by a Waterloo pioneer, Andrew MacCullough. In 1869, the Kitchener council allotted $3,818 for a building to house the council chambers, telegraph and express office and a market, which was to be located in the basement. By 1907 the market had outgrown its quarters and a new building was constructed at a cost of $17,272. This served for 66 years.

In August 1973, the old quarters were demolished and a new market building was erected on the site of the old

market at Duke and Frederick Streets, which opened on June 29, 1974. The market is part of a $15 million downtown redevelopment project. The total cost of the market-parking garage complex was $3 million. The market is a two-level building, housing 430 indoor stalls, as did the former building. There are an additional 130 stalls located on the bottom two floors of an adjacent parking garage, the temporary home of the market during the 10 months of reconstruction. The garage has parking space for 750 customers' vehicles. There is a landscaped upper promenade that will eventually provide access to a restaurant and shopping mall now under construction.

The market is designed and decorated to maintain the traditional Pennsylvania Dutch atmosphere for which it is famous. Many of the stalls are operated by Mennonites of Waterloo County who offer their fresh garden and orchard produce in season and a wide variety of specialty products including Dutch apple pie, shoofly pie, jams and jellies, cheese, maple products, apple butter and many craft items.

All of the stalls in the new market building are occupied. The breakdown of types of vendors is as follows:

Inside

Meat - 19 vendors occupy 85 stalls

Cheese - 3 vendors occupy 20 stalls

Fowl - 4 vendors occupy 35 stalls

Baking - 12 vendors occupy 60 stalls

Fish - 2 vendors occupy 9 stalls

Vegetables - 29 vendors occupy 85 stalls

Fruit - 10 vendors occupy 34 stalls

Crafts - 45 vendors occupy 102 stalls

Outside

84 fruit and vegetable vendors occupy 130 stalls.

The stalls are rented one year in advance with rental based upon the type of produce sold. Indoor vendors of fresh produce pay $35 a year for a 4' x 3' stall while meat vendors pay $200 a year. Excellent refrigeration facilities have been installed for meat vendors on the lower level. Outdoor fruit and vegetable vendors sell directly off their trucks and pay $75 a year for a 22' x 9' stall.

The sale of fruits and vegetables produced outside of Ontario is controlled and is permitted only between the first day of December and the 30th day of June, inclusive. During the remainder of the year all produce must be Ontario grown or manufactured. Under the current by-laws of the market, butchers, hucksters, dealers or merchants are not permitted to buy or sell on the market.

Approximately 25 to 30 of the outdoor fruit and vegetable vendors sell only their own produce. The rest of the vendors supplement their own produce by purchasing between 25 and 50 percent of their needs. Although non-growers are no longer permitted, there are two on the market who were there before the current by-law was adopted.

The market is open on Saturdays throughout the year from 4:30 a.m. to 2:00 p.m. Before the new market opened, crowds visiting the Saturday market were estimated at approximately 12,000. Since the opening of the new market, crowds have been estimated at around 20,000. During the summer, June 1 to Thanksgiving, the market is open an additional day on Wednesdays from 7:00 a.m. to 2:00 p.m. Until recently only about one half of the regular number of vendors attended the Wednesday markets and only the indoor facilities were used. By mid-August of 1974, Wednesday crowds had swelled to such proportions that the outdoor facilities were opened for use and the number of vendors increased. It is estimated that Saturday market sales are more than $225,000.

The peak selling period runs from July to Thanksgiving while sales are at their lowest levels during January and February. Peaches and pickles are considered to be the two biggest selling commodities.

The majority of vendors come from the Waterloo County area. However, there are vendors from the Niagara, Simcoe, Delhi and Burlington areas. Selling is usually done by the whole family - husband, wife and children.

The market is owned by the City of Kitchener. To assist in the further growth of the market a consulting service was hired by the city to handle promotional activities. For example, in February the Oecher Penn Group, traditionally known as the Mennonite merry-making group, has a soup day and soup is served to anyone coming to the market with a soup spoon. In January there is a market Costume Day on which people are invited to come to the market in costume and a prize is awarded for the best one.

The Byward Market

Byward Market

The Byward Market, the largest of two farmers' produce markets in Ottawa, was initially built under the overseership of Colonel John By in August 1829, at a cost of $160. It was built at the foot of Lyon Street between Wellington and Sparks Streets in what is now downtown Ottawa. The Market, now located between York and George Streets, has been rebuilt and relocated several times in its history.

There are 235, 8' x 9' stalls in the market, of which approximately 175 are currently occupied. The construction of a new market building has taken up several of the stalls. Stall rental and license fees are based on the type of produce sold by the vendor and the location of the stall. The market gardeners are assigned the best locations and pay the highest license fee. Non-growers occupy about 75 stalls and have the cheaper locations. License fees range from $150 to $300. Sales to wholesalers and retailers are permitted on the market and usually occur before 8:00 a.m.

About 50 operators sell only what they themselves produce. Another 50 sell their own produce plus that of others. The latter often make trips to the Montreal, Leamington and the Niagara areas to bring back produce that is in season ahead of theirs.

There are no restrictions on the sale of imports or other Canadian produce on the market as long as the vendor marks the origin of the produce. The Ottawa market is famous for the quality of its bunching produce - carrots, onions and radishes -- and market vendors from the Kingston and surrounding area often come to buy this produce for re-sale on their markets.

Many of the market vendors are the wives and/or children of the growers. They usually do the selling while the grower attends the harvesting of the crop or goes to other areas to get more produce.

Officially, the market is open from 6:00 a.m. to 6:00 p.m. daily (except Sundays) and until 9:00 p.m. on Fridays. The busiest time of the week is from Thursday to Saturday while the busiest time of the year is in August and September. Sales are quite low in January and February. Spring sales consist mostly of bedding plants and hothouse tomatoes and cucumbers.

The market is city owned and run by the market clerk. He allocates the stalls, collects the rent and polices the overall activity. There are several shops along the market which sell fresh produce and baked goods. These, however, are privately owned and do not come under the jurisdiction of the market clerk.

Presently, a new market building is under construction in the Byward. It is to be completed in May 1975 and is to house 77 stores plus parking for 308 cars.

Another farmers' market is located in the West end of Ottawa. It is much smaller than the Byward Market, having only 37 stalls, each renting for $100 per annum. It also comes under the jurisdiction of the Byward market clerk.

The Ontario Food Terminal

The Ontario Food Terminal, located in Toronto, is a wholesale fresh fruit and vegetable produce market. It is one of the largest terminal markets in Canada, handling about 600,000 tons of produce annually. It was built to serve all Ontario fruit and vegetable growers.

The terminal covers an area of 44 acres and consists of a wholesale produce section and a farmers' market section. The latter is open to all Ontario growers and there is a category for trucker-jobbers. The farmers' market section covers 8 acres with 400 stalls being used to the maximum. Stall rental is on a daily or annual basis. Approximately 25 percent of the total volume of the terminal is sold through this section.

Queen Elizabeth Way Markets

In the early 1950's a serious problem, not unique to Ontario, developed along one of the major highways running through an important fruit and vegetable area. The Queen Elizabeth Way (Q.E.W.), at that time, was a high-speed, four-lane highway which was rapidly getting busier. Many roadside markets were located along the highway and cars stopping to turn into lanes were a traffic hazard. To alleviate this hazard the Department of Highways banned roadside markets from the highway except in specific controlled areas.

Four farmers' markets were established by the Department for the sole use of farmers whose farms bordered on the highway and who had lost their roadside business because of the new regulations. Twelve to fourteen farmers rented stalls in each of these markets for $1 a year. Facilities provided include only a building and one large 6' x 10' angled display table. The Vineland Market, on the west bound lane, was the only one that was used to capacity on weekends. Each of the markets had three to four regular attendants, increasing to 10 on the weekends. A major problem with these markets was that stands were in a single line and the first few stands received most of the customers as they pulled into the limited parking space.

In 1970 the Ministry of Transport expanded the Q.E.W. highway, adding service roads and bridges, making the highway completely controlled-access. The old markets were removed and, on the insistence of the Ministry of Agriculture, two new markets were built within the cloverleaf. One was erected on the east bound lane at Grimsby and the second at Vineland on the west bound lane. Customers now had to leave the highway at the interchange in order to purchase fruit.

The new markets have paved parking lots, hydro, water, lights, and display racks for the tenants. The buildings are attractively designed but have several functional problems including non-equitable distribution of business.

A new leasing arrangement opened the market to any full-time farmer in the Niagara Region who farmed more than 10 acres of fruit and/or vegetables. Applications are made each year and allocation is by lot once the applicant has been approved. Stall rental is $270 a year. A full-time supervisor assures that the facilities are in order and that rules are adhered to. Only Ontario produce may be sold.

Business volume has increased yearly, following a poor performance during the transition period. Total annual sales are estimated at $350,000 to $400,000. Sales for each stall range from $10,000 to $35,000 during the season which lasts from June 1 to October 1.

A disastrous fire completely destroyed the Grimsby Market in Mid-July of this year. New modern facilities are already planned for the site, however, and it is hoped that it will be back in full operation next year.

The markets established along the Queen Elizabeth Highway are the only such facilities in North America. The concept of such 'highway' markets may have future application for other areas.

OBSERVATIONS

There is renewed interest in the concept of farmers' markets. This interest is not all nostalgia, as evidenced by some very detailed programs and very innovative thinking in various parts of the country. Farmers' markets are now being established in shopping plazas and with their success, downtown merchants are taking notice. Some feel that both they and the farmer could benefit from a resurgence of such markets in the city. Some city planners feel that it may be a way of attracting people back to the central core of their cities.

The onus of the movement back to farmers' markets, however, comes not from the grower but from the merchants or local consumers groups and governments. Herein lies one of the major problems. While consumer interest is evidently high, buoyed on by the "back to nature movement" and a desire for direct purchasing from the farmer, producer interest is generally low. The major reasons for the apathy on the part of producers include: (1) the high labor requirements; (2) the relative high cost of operations; and (3) the large proportion of the growers' time involved.

On the other hand, there are several positive factors that make farmers' markets highly attractive to growers. These include: (1) exposure to a potentially large consumer clientele; (2) scheduled hours of operation; (3) utilization of family labor; and (4) an opportunity for a larger percentage of the consumer's dollar. Farmers' markets are, perhaps, most attractive to medium sized producers who wish to sell at retail but are located out of position in respect to establishing roadside or farm markets.

The prerequisites to a successful venture in a farmers' market are essentially the same as for a roadside or farm market. In a study of retail farmers' markets in Ohio in 1963, Smith and Cravens developed a list of questions that groups interested in organizing a farmer's market should consider:[3]

(1) Is there enough potential volume of fresh fruits and vegetables available in a 30 to 50-mile radius?

(2) Are there at least three or four growers for each major produce item who are interested in developing a farmers' market?

(3) Are there 10 to 15 or more growers available from all product groups -- fruit, vegetables, poultry and flowers -- to create a healthy "market" atmosphere?

(4) Are the interested producers willing to diversify production to insure an adequate supply and selection of fresh farm products to attract customers?

(5) Can adequate marketing facilities be provided at reasonable prices? Can they be financed so that they are secure?

(6) Can adequate parking facilities be provided along with the selling or stall facilities?

(7) Would possible location be conducive to easy access to parking from existing traffic patterns?

(8) Are you familiar with the requirements for an efficient physical layout of a farmers' retail market?

(9) Does the neighborhood have the type of families that would patronize a farmers' retail market?

(10) Are there 25,000 to 100,000 families in a 5-mile radius?

(11) What market days and hours would be most satisfactory for customers in the neighborhood?

(12) Are interested growers willing and able to finance such a venture so that it will be controlled by bonafide producers?

The time now seems ripe for farmers' markets. The future will undoubtedly witness the establishment of many such markets in shopping centers, along controlled access highways and even in the central core area of some cities.

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[3] Smith, Melvin W. and M.E. Cravens, "Retail Farmers' Markets as a Means of Direct Sales to Consumers," Research Bulletin 913. Ohio Agricultural Experiment Station, Wooster, Ohio. June, 1962.

ECONOMICS OF GROWING AND FEEDING CORN SILAGE IN THE PRAIRIE PROVINCES

Technological improvements in both crop production and livestock feeding have promoted the growing and feeding of corn silage. Corn silage acreage in Ontario and Quebec has increased every year since 1962. These developments have also reached the prairie provinces and in the future may have a significant effect on the crop and livestock mix of that region. In the United States, the average corn yield increased from approximately 40 to 95 bushels an acre between 1954 and 1973. However, while the acreage planted to corn decreased by about 10 million acres, the acreage harvested for corn silage increased by about 2 million acres.

*A.J.J. Laforge and R.I. Hamilton**

INTRODUCTION

The major agronomic technological changes that have occurred in the prairies are the adoption of chemical weed control for corn, good fertilization practices, seed treatments, earlier hybrids, and better management practices.

In 1969, there were only two corn hybrids that would mature in Manitoba with less than 2,500 corn heat units (CHU)[1]. Most major corn companies and some public institutions intensified their research in hybrids for this area. In 1973, a more detailed CHU map for Manitoba expanded the area of potential grain corn production with the hybrids available. For the 1974 corn crop, there were six grain corn varieties recommended for 2,200 CHU areas, four additional varieties for 2,300 CHU areas, and six other varieties for 2,400 CHU areas (9).

The only chemical weed sprays recommended for corn in Manitoba up to 1969 were 2,4-D, MCPA for annual broad-leaved weeds and Avadex for wild oats (10). In 1970, Atrazine was recommended only as a band spray; in 1971, it was recommended as an overall spray, with Sutan 7.2E as a pre-plant incorporated treatment. By 1974, such chemicals as Bladex, Outfox, Lasso, Eradicane and Prefox were added to the recommended list for weed control in corn. Some of these chemicals can be used as pre-plant soil incorporated treatments, as post-emergence overall sprays, or as post-emergence directed sprays. Depending on the weeds to be controlled, the chemicals can be used singly or in mixtures. The chemical mixtures and the time of application allow great flexibility in weed control programs. The new chemicals do not have the residual problems for other crops that are associated with Atrazine.

Farmers are encouraged to plant corn early because myths that spring frosts kill corn are being refuted and because fungicides are being applied to corn by most seed companies. Fungicides allow seed corn to remain dormant until soil conditions are suitable for germination. Since the growing point of the corn plant remains below the ground until about July 1, seedlings quickly recover from spring frosts.

PURPOSE AND METHODS OF ANALYSIS

The purpose of this article is to analyze under which price conditions corn silage rather than barley should be grown and fed to feedlot cattle in the Prairie Provinces.

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[1] Corn heat units (CHU) are based on the formula:
$CHU = Tmin - 40 + 4.39\ Tmax - .0256\ (Tmax)^2 - 155.18^2$
where Tmin = maximum night temperature Tmax = maximum day temperature. These units are accumulated for each day from May 15 to the first fall frost of 28 degrees F or less.

The analysis is in two sections: (1) growing corn silage; and (2) feeding corn silage to feedlot animals. In both cases, corn silage is compared with barley, and its profitability is compared at various barley prices. For growing corn silage, net returns for each acre are compared with barley at various comparable yields. For feeding corn silage, the cost for each pound of gain is compared with barley at various conversion ratios.

The analysis assumes a high level of management for both crops in terms of timeliness of seeding, level of fertilization, weed control and knowledge of silage production. Also assumed is above-average management for feeding corn silage as measured by average daily gain (ADG) and feed to liveweight conversion ratio.

METHOD OF ANALYSIS AND ASSUMPTIONS

The economics of corn silage production is compared with barley production in terms of a net return to land[2] and management. The price of corn silage for the corn-growing budget is 25 bushels of barley times the price of barley for each ton of dry matter of corn silage ensiled[3]. Results are provided for barley prices of 1 to 6 cents per pound in increments of 1 cent. The analysis of feeding-corn silage will then buy the silage at the same price plus $2.00 for each ton of dry matter for urea and this will also be compared with feeding barley. Land costs were not included because it was assumed that identical land with the same amount of moisture would grow corn silage and barley grain crops at the yield levels compared[4]. The yield levels of 1 to 5 tons of corn silage dry matter by increments of 1 ton are compared with respective barley yields.

The costs included in the analysis cover repairs, depreciation and investment costs, as well as a labor cost of $2.00 to $3.00 an hour, depending on the season. The depreciation and investment costs are for high use of equipment so little obsolescence depreciation would occur. There are no management costs in the budgets.

A corn hybrid that will mature for grain in a certain number of CHU's will reach a satisfactory level of maturity for corn silage in 200 to 300 fewer CHU's. Based on the CHU formula and data covering 10 to 30 years, those areas in Western Canada where most of the land is under cultivation accumulate 2,000 or more CHU's from May 15 to the date of the first fall frost of 28 degrees F or lower. There are presently six recommended hybrids that will mature for grain in 2,200 CHU's.

Various assumptions regarding the costs of production of barley and corn silage had to be made. Identical seed bed preparations for corn and barley were assumed for all yield levels. The cost of seeding for corn was estimated to be 1 dollar an acre higher than for barley for three reasons: (1) corn has a shorter planting season; (2) a corn planter costs more for each unit width; and (3) more fertilizer is applied with corn. The corn plant population is allowed to vary under each expected rainfall level so the same amount of plant dry matter is produced for each plant (one half of a pound for each plant). The rate of seeding for barley is assumed to be 1.0, 1.5, 1.75, 2.0 and 2.0 bushels an acre for respective yields of 17.5, 35.0, 52.5, 70.0 and 87.5 bushels an acre. It was assumed that all nitrogen present in the plant portion removed from the field at harvest had been added to the soil at seeding time. The plant contents assumed were 1.344 percent and 2.112 percent nitrogen (8.4 percent and 13.2 percent protein) on a dry matter basis for corn silage and barley grain. The cost of nitrogen was assumed on the basis of urea at $120 a ton ($13 for each pound of nitrogen). It was assumed that 8 pounds for each acre of phosphate was available from the soil for all budgets. Phosphate requirements (on the basis of .21 percent and .46 percent phosphorus for corn silage and barley respectively as removed from the field) in excess of 8 pounds an acre were provided with 11-48-0 fertilizer at $130 per ton (10.6 cents for each pound of P205 after credit of 13 cents for each pound of nitrogen).

The cost of applying chemical weed control was believed to be the same for both crops at all yield levels. Chemical weed treatment for corn at $7.60 an acre could consist of a pre-plant incorporated treatment of Atrazine at a rate of 2.3 pounds active ingredient an acre or a post-emergent treatment of Atrazine and a non-herbicidal oil at 2 pounds active ingredient plus 1 dollar's worth of oil. The chemical weed control for

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[2]No deductions are made for taxes or other costs of owning land.

[3]The selection of the ratio of 25 bushels of barley for each ton of corn silage dry matter is arbitrary. This method of analysis allows a return to each of the growing and feeding phases. This ratio (not necessarily 25:1) could also serve as part of a contract price for a farmer selling corn silage to a feedlot operator, where the farmer puts up the silage. A change in the ratio transfers profit from one enterprise to the other. The analysis shows the result of such a change.

[4]Whole plant corn and barley have transpiration ratios of 372 and 521 (11, p. 61) which are equivalent to 610 and 436 pounds of dry matter production for each acre inch of water equivalent. Assuming that one half of the barley dry matter production is grain, then land that will produce 1 ton of corn silage will also produce 17.5 bushels of barley. An experiment conducted at Brandon Research Station in 1973 indicates that the ratio of slightly less than 17 bushels of barley for each ton of corn silage dry matter could grow on land with similar management practices (1, 1973, p. 18).

TABLE 1. ESTIMATED PRODUCTION COSTS (LAND EXCLUDED FOR CORN SILAGE AND GRAIN BARLEY AT VARIOUS YIELD AND MOISTURE LEVELS)

	Corn	Barley	Corn	Barley	Corn	Barley	Corn	Barley	Corn	Barley
Yield	1 ton	17.5 bu.	2 tons	35 bu.	3 tons	52.5 bu.	4 tons	70 bu.	5 tons	87.5 bu.
Inches of Rainfall	3.28	3.28	6.55	6.55	9.84	9.84	13.10	13.10	16.4	16.4
Seed Bed Preparation	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Seeding	2.50	1.50	2.50	1.50	2.50	1.50	2.50	1.50	2.50	1.50
Seed	1.20	2.40	2.40	3.60	3.60	4.20	4.80	4.80	6.00	4.80
Nitrogen Fertilizer	3.49	1.96	6.98	3.92	10.47	5.88	13.96	7.84	17.45	9.80
Phosphate	.17		1.19	.78	2.21	1.59	3.23	2.41	4.25	3.22
Applying Chemical	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Chemical Weed Control	7.60	.50	7.60	.50	7.60	.50	7.60	.50	7.60	.50
Swathing		1.25		1.25		1.50		1.75		2.00
Combining		3.00		5.00		7.50		10.00		12.50
Harvesting and Packing in Pit	6.25		12.50		18.75		25.00		31.25	
Estimated Costs Exclusive of Land and Management										
Per Acre	24.21	13.61	36.17	19.55	48.13	25.67	60.09	31.80	72.05	37.32
Per Bushel or Ton	24.21	.78	18.09	.56	16.04	.49	15.02	.45	14.41	.43
Net Returns An Acre Exclusive of Land and Management Costs										
Barley Price ($/bu.)										
.48	−12.21	−5.21	−12.17	−2.75	−12.13	−.57	−12.09	1.80	−12.05	4.68
.96	.21	3.19	11.83	14.05	23.87	24.73	35.91	35.40	47.95	46.68
1.44	11.79	11.59	35.83	30.85	59.87	49.93	83.91	69.00	107.95	88.68
1.92	23.79	19.99	59.83	47.65	95.87	75.13	131.91	102.58	167.95	130.68
2.40	35.79	28.39	83.83	64.45	131.87	100.33	179.91	136.18	217.95	172.68
2.88	47.79	36.79	107.83	81.25	167.87	125.53	227.91	169.78	277.95	214.68

[1] One ton of corn silage dry matter is valued at 25 bushels of barley times the price of barley.

barley was assumed to be a broad-leaf control chemical at $.50 an acre. All barley was windrowed, and it was charged at $1.25, $1.25, $1.50, $1.75, and $2.00 an acre for the five levels of production. The combining charge was estimated on the basis of a $30 an hour custom charge for a combine and truck that would harvest 210 bushels an hour. At 17.5 bushels an acre, extra distances travelled in harvesting this relatively light crop would require an additional $.50 an acre. The cost for each ton of dry matter for harvesting silage and packing in the pit would be $6.25[5]. This would be with a 150 hp. tractor, a hydraulic dump wagon, single axle truck and a hauling distance of 3 to 4 miles.

ESTIMATED COMPARATIVE RETURNS

The profitability of these two crops, which is measured as a net return to land[6] and management, involves the valuation of 1 ton of dry matter of corn silage as equal to 25 bushels of barley. Table 1 shows net returns to land and management for corn silage and barley at barley prices of 1 to 6 cents a pound in increments of 1 cent. Table 2 shows in more detail the price at which the net return to land and management becomes greater for corn silage than for grain barley under each of the five

TABLE 2. PRICE OF BARLEY AT WHICH NET RETURNS TO LAND AND MANAGEMENT ARE EQUAL FOR BARLEY AND CORN SILAGE[1] (AS PER TABLE 1) AND WITH DOUBLED SEED CORN COSTS

Corn Yield	Table 1	Table 1 With Double Seed Corn Cost
	— barley price for each bushel —	
1 Ton	1.413	1.573
2 Tons	1.108	1.268
3 Tons	.998	1.158
4 Tons	.943	1.103
5 Tons	.926	1.086

[1] When 1 ton of corn silage dry matter equals 25 bushels of barley and 17.5 bushels of barley can be grown for each ton dry matter of corn silage.

[5] The Department of Agricultural Economics at the University of Manitoba (18) estimated silage harvesting costs at $5.55 for each ton of dry matter. This study assumed a $1^1/_2$ ton for each acre cereal crop that would require windrowing. Hydraulic dump wagons were not used. The hauling distance was 1 mile.

[6] No deductions are made for taxes or other costs of owning land.

yield levels. At 3 tons an acre yield of corn silage dry matter, returns to land and management are larger when the price of barley is $1.00 or more for each bushel. At 4 and 5 tons of corn silage an acre, the net returns to land and management are greater at $.95 and $.93 for each bushel of barley respectively. Corn silage becomes profitable to grow when yields are low, provided that barley is at a somewhat higher price. This should encourage plant breeders to produce earlier varieties of corn for such areas.

The respective barley yields equivalent to the corn silage yields of 4 and 5 tons are 70.0 and 87.5 bushels an acre. These barley yields are approaching the limit of straw strength and are bordering on serious lodging problems. With high barley yields, complete weed control is a necessity so that higher cost chemical weed sprays for such weeds as wild oats should be considered. The effect would be a lowering of either the price at which corn is more profitable to grow or the number of bushels of barley for each ton of corn silage used in the valuation of corn silage.

There are three types of changes that would raise the break-even price at which corn silage becomes more profitable to grow. These are: (1) an increase in corn silage production costs; (2) a reduction in barley production costs; and (3) an increase in the opportunity cost of corn silage through a reduction in the number of bushels of barley for each ton of corn silage dry matter. As an example, an increase of $1.20 for each ton of dry matter corn silage (double seed corn cost) would raise the break-even price at which corn silage becomes as profitable as barley, as indicated in Table 2. A reduction of barley production costs of 6.86 cents a bushel with no change in corn production costs would have the same effect. The increases in opportunity cost to produce a change in the break-even price equivalent to the above example would be reductions to 24.24, 24.05, 23.96, 23.91 and 23.90 bushels of barley for each ton of corn silage dry matter for the five yields.

LIMITATIONS OF THE ANALYSIS

In the analysis, the corn plant population and the level of the fertilizer application were assumed for a given level of production based on expected moisture and on an average transpiration ratio. The economic results of a yield lower than expected were not estimated. It is important to fertilize corn silage for a high level of production because chemical weed control costs for an acre, which in this analysis do not vary with the level of production, are high compared with barley. A reduction of fertilization and plant population from the expected production level may be economically desirable because of the risk that precipitation will be less than expected. For barley, this reduction may be greater (proportional to yield or moisture used) than for corn. Input-output data for lower yield levels was not available for this type of analysis.

The analysis assumed that only nitrogen and phosphorus removed from the land were replaced and that no potassium was necessary. If high yields of corn silage are removed from the land for several consecutive years, potassium could become short. However, if the manure from the corn silage (not including added straw for bedding) were returned to the acreage that produced it, more than half of the potassium would be returned to the soil. Half of the phosphorus would also be returned to the soil along with some of the nitrogen and the micro-nutrients. When barley is grown and sold, the land loses all of these nutrients.

Since partial budgets do not take the total farm into consideration, these results may not be applicable to some farms. The analysis tried to allow for this by varying the labor charge, depending upon the season and the degree of skill required. In view of wages in the non-farm sector and the seasonality of employment, the range of 2 to 3 dollars an hour may not be adequate to cover these costs.

In order to keep costs at a minimum, the analysis assumed high use of large machinery. Small farmers are not excluded if several would co-operate in the purchase of one set of equipment and work together. At a minimum, harvesting corn silage is a three-man operation, whereas combining could be a one- or two-man operation.

FEEDING CORN SILAGE

Except for silage production, the agronomy of corn differs slightly from the agronomy of cereals. Little information is available on some aspects of feeding corn silage. Background information is presented on corn silage quality and experimental results of feeding it to feedlot animals. This is followed by an economic analysis of feeding corn silage.

Corn Silage Feed Quality

The protein content of corn silage is low at all stages of maturity, but it is best fed to ruminants that are able to synthesize proteins from nitrogen compounds. As an example, compounds such as urea can be used to supplement corn silage to 12 to 14 percent protein content, a level satisfactory for most classes of growing beef cattle.

Energy concentration is quite high compared with cereal silages. Corn silage approaches a concentrate feed at 70 percent TDN (dry matter basis) and maintains its high TDN for an extended period after maturity.

Successful corn silage and its feeding value depend on the fermentation achieved in ensiling. Silage fermentation is a complicated process and no attempt will be made here to explain it. However, corn is one of the easiest plants to ensile properly.

Average daily gain and feed to liveweight gain ratio for silage are related to its palatability (intake) and digestibility for livestock. As the feed consumption by an animal increases, the proportion available for production above maintenance requirements increases, thereby reducing the feed required for a pound of gain and increasing the average daily gain.

Beef Feedlot Performance

Michigan State University has conducted numerous experiments with corn silage for finishing feeder cattle to determine whether, as the sole feed ingredient, it will produce sufficient daily gains, economical feed conversions and adequate finish. Rations have consisted of corn silage as the sole feed ingredient (supplemented for protein) and of shelled corn at 1 percent of body weight of the feeder animal plus all the corn silage the feeder will consume. Over the feeding period, shelled corn at 1 percent of body weight was equivalent to 40 percent of the ration on a dry matter basis. The corn silage was treated with urea at the time of ensiling or supplemented with either soymeal or urea at the time of feeding, all at the 12 to 13 percent protein level.

The gains and conversion ratios of urea treated versus soymeal supplemented rations were similar in Michigan State experiments. In some cases one was slightly better than the other, but no consistency was evident. High average daily gains and low feed conversions in the all-silage fed groups were associated with low fat cover rather than with the type of protein supplement.

The University of Guelph conducted two experiments in 1967-68 and 1968-69, comparing whole plant barley silage, ground whole plant barley, and whole plant corn silage (Table 3). All rations were supplemented with 2 pounds of soymeal a day for each animal in the first experiment and 1-1/2 pounds in the second experiment. The whole plant barley was ground through a one-quarter inch hammermill screen. The grain to straw ratio was 50:50 for barley grown in 1967 and 60:40 in 1968. In 1968, the corn silage was harvested late at a moisture content of 54 percent. This resulted in lower consumption and, therefore, in a poorer ADG and conversion ratio despite the higher TDN indicated by sheep digestibility trials. TDN estimates were 56.3 and 60.8 percent for whole plant barley, and 70.5 and 74.3 percent for corn silage.

TABLE 3. UNIVERSITY OF GUELPH FEEDING TRIAL RESULTS

	Whole Plant Barley		
1967-68 — 196 Days	Silage	Dry Ground	Corn Silage
Number of Animals	18	18	18
Initial Weight	693	675	682
Final Weight	1,031	1,041	1,120
Average Daily Gain	1.72	1.87	2.22
Feed DM for each Pound Gain	11.4	10.9	8.4
Estimated TDN for each Pound Gain	7.15	6.14	5.92
Carcass Data			
Dressing %	55.1	55.3	57.6
Fat Over Rib Eye (Inches)	.39	.53	.61
1968-69 — 236 Days			
Number of Animals	18	18	18
Initial Weight	497	482	475
Final Weight	920	961	972
Average Daily Gain	1.80	2.05	2.05
Feed DM for each Pound Gain	9.0	8.5	7.9
Estimated TDN for each Pound Gain[1]	5.45	5.17	5.87
Carcass Data			
Dressing %	53.6	54.7	56.5
Fat Over Rib Eye (in.)	.38	.56	.53

[1] On basis of digestible energy (DE) trials on sheep and converting by formula TDN = D.E. (kcal/kg) x .82 x 100 ÷ 4409.

The dressing percentage is higher for animals which are fed corn silage than for the fed high forage rations where the dry matter conversion ratio would be 10:1 to 12:1. Animals do not develop large gastro-intestinal systems when consuming corn silage.

These gains and conversion ratios may be somewhat better than those achieved by feedlot operators because only steers are used; the silage is probably better quality than what feedlot operators would produce; and any sick animals are removed from experiments. Feed which animals refuse to consume is included in the conversion ratios. Conversion ratios do not include allowances for corn silage losses in the fermentation process.

ECONOMICS OF FEEDING CORN SILAGE TO FEEDLOT CATTLE

Method of Analysis and Assumptions

Two important variables in finishing feedlot cattle are the average daily gain (ADG) and the rate of conversion of feed into liveweight gains. It is assumed here that the ADG with corn silage as the only feed ingredient is 2 pounds per day. This will be compared with a ration consisting of 90 percent barley and 10 percent straw, which is assumed to produce an ADG of 3 pounds per day. The conversion ratios used are 8:1 and 10:1 for corn silage on a dry matter basis and 8:1 and 9:1 for barley on an "as fed" basis. The cost of straw is assumed to be constant at $10 per ton, while the cost of barley varies from 1 to 6 cents per pound or from $.48 to $2.88 per bushel. The cost of 1 ton of corn silage dry matter is assumed to be equivalent to 25 bushels of barley plus $2.00 a ton for urea to raise the protein content from 8.4 to 12.4 percent on a dry matter basis.

The daily costs of keeping an animal in a feedlot are shown in Table 4. Although each requires different equipment, the cost of feeding corn silage (yardage) is believed to be the same as it is for the barley ration. The corn silage system would require equipment for removal of silage from the pit, while the barley system would require grinding equipment. Other non-feed costs would be the same for both feeds on a daily basis, but the barley ration would be at a lower cost for a unit of gain as indicated in the lower part of Table 4. The measure of profitability of using corn silage or barley for feedlot animals is the cost for each pound of gain[7].

[7]This does not include the negative margin between the purchase price of feeders and the selling price of finished animals, as this margin would be the same for both feeds.

TABLE 4. DAILY NON-FEED FEEDLOT COSTS AND COST FOR EACH POUND OF GAIN AT VARIOUS RATES OF GAIN

	Cents A Day
Yardage	10.
Interest[1]	11.
Death Loss[2]	2.2
Salt, Minerals and Vitamin A	1.
Veterinary Medicine, Implants	1.
Total Feedlot Costs A Day	25.2

Non-Feed Costs at Various Average Daily Gains

ADG	Costs for each Pound of Gain
3 Pounds	8.4
$2^1/_2$ Pounds	10.08
2 Pounds	12.6
$1^1/_2$ Pounds	16.8
1 Pound	25.2

[1]Average value of $400 at 10% a yr.
[2]Average value of $400 at 2% a yr.

Estimated Feeding Returns

Figure 1 shows the cost for each pound of gain based on the above assumptions for conversions of 8:1 and 9:1 for barley and 8:1 and 10:1 for corn silage. The points of intersection of the lines indicate the prices of barley at which it is equally profitable to feed either corn silage or barley based on the above assumptions. Table 5 shows in more detail and for more conversion ratios at what prices corn silage and barley are equally profitable. If a

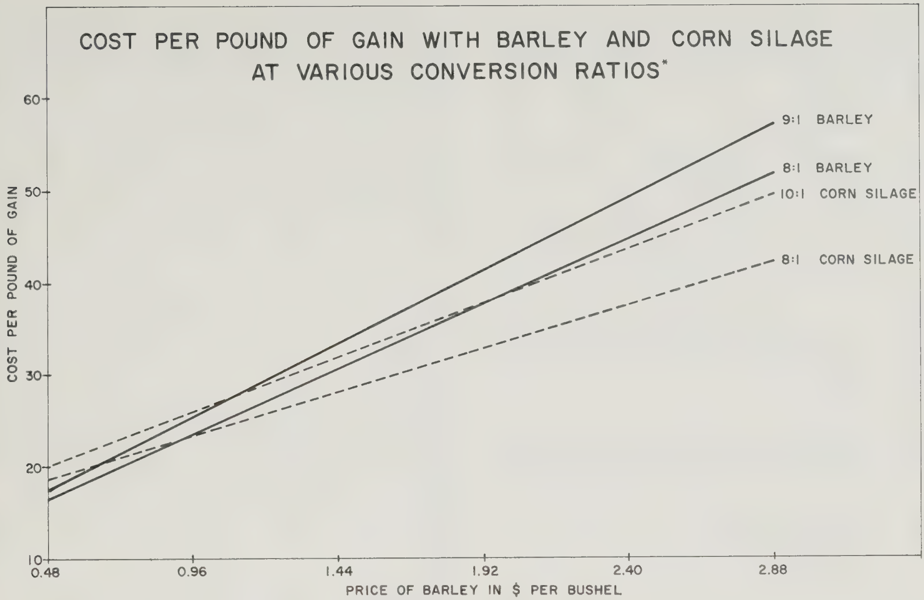
TABLE 5. PRICE OF BARLEY AT WHICH CORN SILAGE IS FED RATHER THAN BARLEY AT VARIOUS CONVERSION RATIOS WHEN CORN SILAGE COSTS 25 BUSHELS OF BARLEY PLUS $2.00 FOR A TON OF DRY MATTER[1]

Dry Matter Conversion Ratio	Equivalent Conversion Ratio at 85%	Barley Conversion Ratio (Moisture as Fed) 8:1	9:1
— corn silage —		— $/bushel —	
10:1	11.76:1	1.920 (1.60)	1.086 (.974)
9:1	10.59:1	1.253 (1.119)	.827 (.765)
8:1	9.41:1	.920 (.852)	.662 (.625)
7:1	8.24:1	.720 (.682)	.548 (.525)

Barley Ration: 90% barley and 10% straw
Straw at $^1/_2$ cents a pound
ADG of 3 pounds a day
Non-Feed costs — 25.2 cents a day

Corn Silage: ADG of 2 pounds a day
Non-feed costs of 25.2 cents a day

[1]With prices in brackets when corn silage costs 24 bushels of barley plus $2.00 a ton of dry matter.



* *With barley costing $0.48 to $2.88 per bushel and 1 ton corn silage dry matter costing 25 bushels of barley, plus $2.00.*

Figure 1

producer can obtain gains of 2 pounds a day and a dry matter conversion of 8:1 with corn silage or 3 pounds a day and conversion of 8:1 with a 90 percent barley and 10 percent straw ration, he should use corn silage when the price of barley is above $.92 a bushel. If the expected conversion ratios are 8:1 for barley and 9:1 for corn silage, corn silage should be fed when the price of barley is above $1.26 per bushel. If a conversion ratio of only 9:1 can be obtained with barley and 10:1 with corn silage, corn silage should be fed when the price of barley is above $1.09 a bushel.

In the analysis of the economics of growing corn silage, it was mentioned that the opportunity cost of corn silage at higher yields could be less than 25 bushels of barley. Table 5 shows the break-even costs of feeding corn silage when there is such a reduction to 24 bushels for a ton of dry matter corn silage. At poorer conversion ratios for corn silage relative to grain barley rations, the reduction of the price of barley at which it becomes advantageous to feed corn silage is high. At good conversion ratios for corn silage relative to barley, the reduction is small, being only 3.7 cents a bushel at conversion ratios of 8:1 and 9:1 for corn silage and barley respectively.

Savings in cents per pound of gain when feeding corn silage compared with barley to feeder animals at various prices and conversion ratios are shown in Table 6. If the price of barley is 4 cents a pound and a farmer can obtain a conversion ratio of 10:1 and 9:1 for corn silage and barley respectively, he would save 3.65 cents for each pound of gain. With the same barley price and conversion factors of 8:1 for both feeds, he would save 5 cents for each pound of gain. At lower prices and poor corn silage conversions relative to barley, the savings become less and the break-even points are shown in Table 5.

Should the opportunity cost of growing corn silage be changed from 25 bushels of barley to 24, the savings in Table 6 would be increased by .240 of a cent and .192 of a cent for a pound of gain times cost of barley in cents for each pound for the 10:1 and 8:1 corn silage conversion ratios respectively. That is, at 4 cents a pound, barley and an opportunity cost of 24 bushels of barley, Table 6 would read .96 (0 + .96), 4.61 (3.65 + .96), 5.768 (5.0 + .768) and 9.418 (8.65 + .768) cents savings for each pound of gain when feeding corn silage is compared with barley.

Limitations of Analysis

For simplification, average daily gain was not allowed to vary with the conversion ratio. With a corn silage conversion ratio of 8 pounds of dry matter for a pound of gain, the average daily gain could be increased to $2^1/_4$ or $2^1/_2$ pounds; whereas, for the barley ration, an ADG of 3 pounds may be too high for the conversion ratio of 9:1.

TABLE 6. SAVINGS FOR EACH POUND OF GAIN WHEN FEEDING CORN SILAGE VERSUS BARLEY AT VARIOUS BARLEY PRICES AND CONVERSION RATIOS[1]

	Corn Silage	10:1	10:1	8:1	8:1
Barley Price	Barley	8:1	9:1	8:1	9:1
$/bu			– C –		
.48		−3.6	−2.65	−2.2	−1.25
.96		−2.4	− .55	.2	2.05
1.44		−1.2	1.55	2.6	5.35
1.92		0	3.65	5.0	8.65
2.40		1.2	5.75	7.4	11.95
2.88		2.4	7.85	9.8	15.25

[1] Derived from Figure 1.

The interest rate used in the feeding analysis was 10 percent. As the interest rate rises, barley would be favored because animals make the same gain sooner on barley than on corn silage. The effect of a change in the interest rate was not attempted.

SUMMARY AND CONCLUSIONS

The question exists as to whether Western Canadian Prairie farmers will be interested in growing corn silage instead of barley. If a farmer can deliver barley to the elevator at 4 cents a pound and net $75.13 an acre for land and management returns, will he want to net $95.87 an acre with corn silage? The level of management required for corn silage is somewhat greater than for barley. Corn must be planted early, weed control must be complete, fertility must be high, cash inputs for each acre are high, knowledge of silage making is imperative, and the corn silage must be fed to livestock.

The analysis of growing corn silage was based on a yield ratio of 17.5 bushels of barley, where 1 ton of corn silage dry matter would grow. Experimental data from the Brandon Research Station, as well as farm experience in Manitoba, indicate that corn is a more efficient user of moisture compared with barley. This yield ratio was held constant and the profitability of growing these two crops was compared at per acre yields of 1 to 5 tons of corn silage dry matter. As the yields increase for each acre, the profitability of growing corn silage compared with barley occurs at lower barley prices. The per bushel price of barley at which the returns to land and management are equal for corn silage and barley are $1.41, $1.11, $1.00, $.95 and $.93 for the yields of 1 to 5 tons respectively.

The corn silage was valued for the growing phase at 25 bushels of barley times the price of barley. The selection of 25 bushels was arbitrary but deviations from it would only transfer profit from one enterprise to the other, as the corn silage is charged to the feeding operation at the same price plus $2.00 a ton for protein supplementation. Whether more or less than 25 bushels a ton of corn silage dry matter were used as part of a farm to feedlot, the contract would depend on the bargaining position of each. This method of analysis is convenient in that all returns are not calculated as either part of a crop enterprise or part of a feeder cattle enterprise.

The feeding of corn silage to feedlot animals requires that the silage be well made in order to sustain good daily gains and conversion ratios. At a conversion ratio of 10 pounds of corn silage dry matter compared with 9:1 for a barley ration, corn silage is more profitable to feed when the price of barley is $1.09 or more a bushel. At a 10:1 corn silage dry matter conversion ratio compared to 9:1 with a 90 percent barley and 10 percent straw ration, when barley is 4 cents a pound, a saving of 3.65 cents for each pound of gain would be made and 92.8 percent more beef gains could be produced from the same acreage. If the relevant conversion ratios are 8:1 and 10:1 for barley and corn silage respectively, the cost of gain would be the same, but 71.5 percent more gains could be produced from the same acreage.

Feeding corn silage could have a considerable impact on the prairie livestock industry. Feedlots would have to be located in areas where corn silage is grown. Backgrounding[8] of feeder calves would not be required, so more forage acreage would be available for cows. Leaner finished animals would be produced and finished weights might be heavier.

There would be changes in the competitive position of the prairie area vis-a-vis Ontario and U.S.A. feedlot operators. Increased competitiveness of Western Canadian feedlot operators would reduce the flow of stocker animals to areas outside the prairies. At constant finished beef prices, cow-calf operators would receive higher prices for their calves. This would make it more attractive for them to increase cow numbers to satisfy the demand of an increasing Canadian population. All these things combined would have an impact on the slaughter industry in Western Canada.

The higher level of production for an acre of corn silage over barley would permit more acreage to be used for wheat, flax, rapeseed, forage for cows, and barley for export or hog production.

[8] Backgrounding is the practice of growing calves on rations of high forage content before fattening on grain rations.

This analysis shows that it is important for farmers to know with some degree of certainty what the price of feedgrains will be in the next feeding period because corn has to be grown before it can be fed. For the 1974-75 crop year, the initial price of No. 2 CW barley was $1.65 per bushel basis Thunder Bay[9]. At this price level corn should have been seeded on land that is capable of producing 2 or more tons of silage dry matter an acre.

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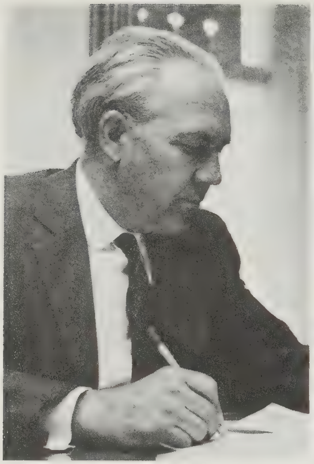
FARM BUSINESS FINANCING AND TAXATION RELATIONSHIPS



R.S. Rust*

The demand for credit by farmers continues to increase. In 1973, income prospects and higher prices for nearly all farm products created an extremely strong demand for credit of all types, but especially for long-term credit.

While the general agricultural situation in 1974 has not been as encouraging for many farmers as it was the previous year, a further increase in the rise of credit is expected to be recorded.

INTRODUCTION

The availability of all types of farm credit and sound judgements on when or when not to use credit are becoming increasingly significant factors in achieving greater farm efficiency, production and incomes in the future. While increases in farm product prices in recent years have greatly assisted many farmers in providing considerable financing from savings, continued inflation effects on development, replacement, and production costs have offset many of these price gains.

In spite of improved farm product prices and the continued decrease in the number of farms, the demand for credit by farmers continues to increase. Farmers generally borrow more, and credit sources are willing to disburse more funds into agriculture when there are good prospects of relatively high farm incomes. As farms become larger and more commercialized, credit requirements for individual farms greatly increase. However, a significant proportion of recent yearly increases in the amount of credit used in agriculture is attributable to the increased costs of land, equipment and purchased inputs.

The slow-down in the amount of credit extended during the 1968 to 1970 period was followed by an increase of nearly 18 percent in 1971, a 12-percent increase in 1972 and it appears that the increase in 1973 may be in the 14 to 16-percent range when all data are available. While farmers have been fortunate in obtaining a large proportion of their past credit requirements at relatively moderate interest rates, the current and future prospects suggest that a large proportion of farm credit will only be obtained at relatively high rates and that these rates will have a dampening effect on many production plans. The strong demand for food products, and prospects of greatly increased farm incomes coupled with encouraging interest rates, resulted in a very strong demand for long-term loans in 1973. Farm Credit Corporation loans in 1973 increased nearly 114 percent over the amount extended in 1972. A less dramatic increase of about 30 percent is expected for 1974. Providing bond formula interest rates apply, the expected increase in these rates on April 1, 1975 and on October 1, 1975 could have a significant impact on the demand for FCC credit.

During the 1961 to 1972 period the number of farms decreased from about 481,000 to an estimated 353,000 and between 1966 and 1971 approximately 4.5 million acres of land were taken out of agricultural use. In spite of these events, the amount of credit used by farmers increased from about $1,143 million in 1961 to nearly $3,000 million in 1972. While the very large increase extended in 1971 was mostly attributable to the after effects of the surplus grain problem and low farm incomes in the 1968 to 1971 period which tended to

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TABLE 1. ESTIMATED FARM CREDIT EXTENDED, CANADA, 1960 AND 1968 TO 1972[a]

Source and Term of Credit	Estimated farm credit extended 1960	1968	1969	1970	1971	1972	Estimated average interest rate 1971	Estimated average interest rate 1972	Percent of credit extended by source 1972
	– millions of dollars –						– percent –		
LONG-TERM (more than 10 years)									
Farm Credit Corporation	52.3	205.3	158.0	116.5	109.7	156.0	7.7	6.7	5.2
Veterans' Land Act	19.4	20.1	17.9	10.5	20.6	11.4	7.7	6.7	0.4
Provincial government agencies	37.0	60.4	42.8	42.4	47.2	36.9	3.8	6.2	1.2
Private individuals	7.0	15.0	17.0	20.0	22.0	17.0	7.0	7.0	0.6
Insurance, trust and loan companies	3.0	13.0	7.0	5.0	3.0	5.0	10.7	10.5	0.2
Treasury Branches (Alberta)	1.6	1.0	1.0	0.8	1.7	3.7	8.5	9.0	0.1
Alberta Electrical Co-operatives	2.0	2.0	2.0	1.6	1.8	1.9	3.5	3.5	0.1
Total long-term	122.3	316.8	245.7	196.8	206.0	231.9	6.8	6.8	7.8
INTERMEDIATE-TERM (18 months to 10 years)									
Banks (FILA)	101.9	40.2	142.0	103.0	147.4	177.9	7.0	6.6	6.0
Banks (other than FILA)	–	–	20.0	30.0	55.0	65.0	7.2	8.4	2.2
Private individuals	75.0	130.0	144.0	148.0	146.0	151.0	7.0	6.7	5.1
Supply companies	29.0	35.0	31.0	40.0	51.0	144.3	14.5	14.9	4.8
FCC (loans to farm syndicates)	–	1.7	2.9	1.8	1.9	1.9	6.9	6.2	0.1
Insurance, trust and loan companies	0.5	5.0	7.0	8.0	10.0	27.0	11.0	10.5	0.9
Industrial Development Bank	–	8.4	9.5	9.5	11.4	16.5	9.5	9.5	0.6
Credit Unions	4.0	70.0	40.0	63.0	82.4	90.1	9.1	9.0	3.0
Municipalities (Ontario Tile Drain Act)	1.0	4.3	5.1	5.8	5.9	4.7	4.0	4.0	0.2
Finance companies (cars and trucks)	8.0	15.0	11.0	9.0	13.0	16.0	13.5	11.0	0.5
Treasury Branches (Alberta)	0.3	2.3	3.0	2.1	4.4	6.9	7.5	8.2	0.2
Total intermediate-term	219.7	311.9	415.5	420.2	528.4	701.3	8.3	9.1	23.6
SHORT-TERM (up to 18 months)									
Banks (other than FILA)	302.0	895.0	990.9	1,126.0	1,314.0	1,404.0	8.2	7.8	47.2
Supply companies	237.0	300.0	218.0	203.0	275.0	269.2	15.0	11.0	9.0
Credit Unions	55.0	187.0	116.0	109.0	134.4	163.6	9.4	9.2	5.5
Finance companies (household and personal)	6.0	12.0	13.0	9.0	12.0	14.0	18.0	16.0	0.5
Dealers, stores, etc.	25.0	14.0	12.0	9.0	10.0	10.0	16.0	14.0	0.3
Private individuals	55.0	105.0	115.0	120.0	105.0	104.0	7.0	7.0	3.5
Treasury Branches (Alberta)	8.0	17.1	19.0	22.0	24.7	27.4	7.0	7.0	0.9
Sedco (Saskatchewan)	–	0.6	4.8	0.5	1.2	1.3	9.6	8.4	0.1
Co-operative programs	–	17.3	19.0	24.0	30.0	49.1	9.6	10.4	1.6
Totals Short-term	688.0	1,548.5	1,507.7	1,622.5	1,906.3	2,042.6	9.3	8.4	68.6
Total all credit	1,030.0	2,177.2	2,168.9	2,239.5	2,640.7	2,975.8	8.9	8.5	100.0

[a]For years 1961 to 1967 see R.S. Rust, A Review of Farm Credit and Farm Income Relationships, Canadian Farm Economics, Vol. 5, No. 2, June 1970.

decrease normal expenditures on upkeep and expansion, the smaller increase in 1972 was more in line with long-run yearly increases in credit extended. In 1972, the total estimated credit extended to farmers from all sources was $2,975.8 million (Table 1). This amount includes accounts to June 1973. Banks are estimated to have contributed 47.2 percent of this amount in the form of short-term credit and 8.2 percent of the total in intermediate credit of which 6.0 percent were represented under the Farm Improvement Loans Act (FILA). The total amount of credit extended by banks may be somewhat underestimated since no allowance was made for personal loans by banks to farmers. The only published data available on bank loans to farmers pertain to loans outstanding. While it appears that some personal loans may be included under bank loans outstanding to farmers, most personal loans such as those for the purchase of cars and trucks are usually classified, according to bank officials, with the personal loans to all individuals. Except for FILA loans, all presented data on credit extended by banks are derived estimates.

The second largest source of farm credit, that of farm supply companies, is estimated to have contributed nearly 14 percent of the credit used by farmers in 1972. Feed and fertilizer companies supplied the largest proportion of the short-term credit from such sources, while farm machinery and equipment companies were the largest suppliers of intermediate-term credit. In view of the extremely large number of companies in the farm supply company category and the relatively low response to inquiries, it is believed that estimates on both short and intermediate credit from this source may be conservative. In most instances, the credit activity of the larger companies has been well reported and represented in these estimates.

Prospects of a strong demand and higher prices for agricultural products resulted in an increase of $25.9 million in long-term credit being extended in 1972. However, the amount of credit extended by the Veterans' Land Act Administration, provincial government agencies, and private individuals, decreased while the amount extended by the Farm Credit Corporation was $46.3 million greater than in 1971. While the FCC extended $156.0 million in 1972, this amount was well below the previous peak year of $251.2 million in 1967.

The total direct farm credit supplied in 1972 by federal government agencies (FCC, VLA and IDB) is estimated to have been $185.8 million compared to $143.6 million in 1971. In addition, FILA loans disbursed by banks and guaranteed by the federal government increased from $147.4 million in 1971 to $177.9 million in 1972.

The prime rate on bank business loans decreased from 7.5 percent in December 1971 to 7.0 percent in January 1972. Further decreases resulted in a prime rate of 6.0 percent in November 1972. The average estimated interest rate on all loans to farmers is shown in Table 1 as 8.5 percent, a decrease of 0.4 percent from the previous year. Since the average lending rate of banks tends to range from 1.5 to 2.5 percent above prime rates, with the probable average being about 2 percent, the average interest rate of 8.5 percent in 1972 on farm credit extended from all sources tends to be lower than might be expected and was partly attributable to the relatively low rates which applied to loans from federal and provincial government agencies. The average estimated interest rate on long-term loans in 1972 remained the same as in 1971 at 6.8 percent, short-term loan rates decreased from an average of 9.3 to 8.7 percent, and intermediate-term loans increased from an average of 8.3 percent in 1971 to 9.1 percent in 1972. The increase in the average rate on intermediate-term loans is somewhat deceiving since it is largely attributable to both improved reporting and to larger amounts of credit extended by some farm supply companies rather than to any significant increase in interest rates charged by the various sources.

The total amount of credit outstanding on the farm accounts of all credit sources at the end of 1972 has been estimated at $5,085.2 million, an increase of $370.9 million over the previous year (Table 2). This amount includes accounts to June 1973. Long-term credit represented 37.7 percent, intermediate-term 28.2 percent, and short-term 34.1 percent of total farm indebtedness. Twenty-seven percent of all farm indebtedness was held by federal credit agencies or institutions while 71 percent of the long-term farm debt was on federal farm credit agency accounts. The weighted average interest rate on outstanding farm credit decreased from 7.7 percent in 1971 to 7.4 percent in 1972 while the estimated interest charges increased from $364 million in 1971 to more than $376 million in 1972.

The Bank of Canada Review for May 1974 indicated that outstanding loans to farmers by chartered banks at the end of 1972 amounted to $1,569 million. This amount included FILA loans and loans guaranteed by provincial governments. Approximately 79 percent of the $1,569 million outstanding was related to farm accounts in Ontario, Alberta and Saskatchewan while accounts in Manitoba, Quebec and British Columbia represented about 18 percent of the total. Farm accounts in the Atlantic Region represented less than 3 percent of the indebtedness of farmers to banks (Table 3). Based on the estimated number of census farms for

TABLE 2. ESTIMATED FARM CREDIT OUTSTANDING, CANADA 1960 AND 1968 TO 1972[a]

Source and Term of Credit	Estimated farm credit outstanding 1960	1968	1969	1970	1971	1972	Estimated average interest rate 1971	Estimated average interest charge 1971	Estimated average interest rate 1972	Estimated average interest charge 1972	Percent of credit outstanding by source 1972
	– millions of dollars –						percent	millions of dollars	percent	millions of dollars	percent
LONG-TERM (more than 10 years)											
Farm Credit Corporation	158.4	1,036.1	1,111.5	1,154.1	1,182.5	1,229.1	5.9	69.77	6.0	72.30	24.2
Veterans' Land Act	91.2	180.4	167.5	155.9	151.5	147.2	5.8	8.79	6.0	8.83	2.9
Provincial Government agencies	160.0	351.7	372.1	398.1	395.7	404.6	3.9	15.43	4.6	18.61	7.9
Private individuals	31.0	67.0	70.0	75.0	80.0	72.0	6.0	4.80	6.0	4.32	1.4
Insurance, trust and loan companies	12.0	60.0	58.0	54.0	49.0	46.0	9.3	4.56	9.3	4.28	0.9
Treasury Branches (Alberta)	1.2	1.4	1.0	1.9	3.1	5.0	8.9	0.28	9.0	0.45	0.1
Alberta Electrical Co-operatives	19.7	16.8	16.1	15.3	14.1	13.7	3.5	0.49	3.5	0.48	0.3
Total long-term	473.5	1,713.4	1,796.2	1,854.3	1,875.9	1,917.6	5.6	104.12	5.7	109.27	37.7
INTERMEDIATE-TERM (18 months to 10 years)											
Banks (FILA)	178.1	308.5	306.1	296.0	321.0	374.0	7.8	25.04	7.3	27.30	7.4
Banks (other than FILA)	–	–	21.0	30.0	50.0	80.0	8.3	4.15	8.2	6.56	1.6
Private individuals	300.0	510.0	560.0	550.0	540.0	547.0	6.3	34.02	6.4	35.01	10.8
Supply companies	78.0	120.0	134.0	121.0	130.0	185.2	14.5	18.85	14.9	27.59	3.6
FCC (loans to farm syndicates)	–	3.4	4.8	6.1	6.8	6.7	7.7	0.52	7.4	0.50	0.1
Insurance, trust and loan companies	4.0	20.0	18.0	16.0	15.0	32.7	9.7	1.46	9.6	3.14	0.6
Industrial Development Bank	–	23.0	26.0	29.0	34.0	42.0	9.5	3.23	9.2	3.86	0.8
Credit Unions	5.0	125.0	103.0	89.0	104.0	110.0	9.5	9.88	9.3	10.23	2.2
Municipalities (Ontario Tile Drain Act)	4.2	12.9	16.1	19.6	22.8	24.4	4.0	0.91	4.0	0.98	0.5
Finance companies (cars and trucks)	10.0	21.0	18.0	19.0	21.0	23.0	15.0	3.15	11.5	2.64	0.5
Treasury Branches (Alberta)	0.4	3.9	3.9	4.0	4.9	6.7	8.0	0.39	8.2	0.55	0.1
Total intermediate-term	579.7	1,147.7	1,210.9	1,179.7	1,249.5	1,431.7	8.1	101.60	8.3	118.36	28.2
SHORT-TERM (up to 18 months)											
Banks (other than FILA)	241.5	716.0	792.7	880.6	1,006.9	1,116.0	8.8	93.01	7.8	87.05	21.9
Supply companies	178.0	242.0	254.0	230.0	220.0	185.2	15.0	33.00	12.0	22.22	3.6
Credit Unions	45.0	150.0	220.9	181.0	204.0	259.0	9.5	19.38	9.2	23.83	5.1
Finance companies (household & personal)	5.0	10.0	12.0	9.0	10.0	12.0	18.0	1.80	18.0	2.16	0.2
Dealers, stores, etc.	8.5	5.0	6.0	7.0	6.0	8.5	16.0	0.96	15.0	1.28	0.2
Private individuals	44.0	90.0	95.0	95.0	90.0	86.0	7.0	6.30	7.5	6.45	1.7
Treasury Branches (Alberta)	6.0	13.7	17.7	20.5	23.2	28.4	7.5	1.74	7.0	1.99	0.6
Sedco (Saskatchewan)	–	1.7	2.4	5.3	6.8	2.8	9.4	0.64	8.4	0.24	0.1
Co-operative programs	–	12.3	12.0	11.3	16.0	30.4	9.7	1.55	10.6	3.22	0.6
Unpaid taxes	1.8	3.0	5.0	7.0	6.0	7.6	6.0	0.36	6.0	0.46	0.1
Total short-term	529.8	1,243.7	1,417.7	1,446.7	1,588.9	1,735.9	10.0	158.74	8.6	148.90	34.1
Total all credit	1,583.0	4,104.8	4,424.8	4,480.7	4,714.3	5,085.2	7.7	364.46	7.4	376.53	100.0

[a]For years 1961 to 1967 see R.S. Rust, a Review of Farm Credit and Income Relationships, Canadian Farm Economics, Vol. 5, No. 2, June 1970

TABLE 3. AMOUNTS OUTSTANDING BY PROVINCE ON FARM ACCOUNTS OF CHARTERED BANKS, DECEMBER 1972.

Province	Amount outstanding on farm accounts in millions of dollars[a] 1972	Percent of total outstanding 1972	Estimated number of census farms 1972	Average dollar indebtedness per census farms 1972
	millions of dollars	percent	number	dollars
British Columbia	75	4.78	18,263	4,107
Alberta	420	26.77	61,360	6,845
Saskatchewan	314	20.01	75,227	4,174
Manitoba	136	8.67	34,028	3,997
Ontario	505	32.19	91,689	5,508
Quebec	79	5.04	57,450	1,375
New Brunswick	13	0.83	4,841	2,685
Nova Scotia	11	0.70	5,285	2,081
Prince Edward Island	14	0.89	4,180	3,349
Newfoundland	2	0.12	909	2,200
Total Average	1,569	100.00	353,232	4,442

[a]Bank of Canada, Bank of Canada Review, March 1973.

1972, the average indebtedness of farmers to banks ranged from $6,845 per farm in Alberta to $1,375 in Quebec. In a recent study of the use of short-term credit in Quebec it was concluded that bank activity in this field was considerably less than in the rest of Canada.[1] In 1972 the total amount of loans outstanding on the farm accounts of banks represented 6.7 percent of total bank loans outstanding compared with 7.2 percent in 1971.

The proportion of agricultural credit extended each year for short, intermediate and long-term periods indicates the changing pattern of credit flows into the industry. In periods of relatively high farm income prospects, the flow of long-term credit greatly increases as demonstrated in 1967 and again in 1973. However, as income prospects decline, the short-term flow tends to increase as a proportion of total credit extended. The data in Table 4 indicate that within the period 1961 to 1972, long-term credit reached a peak of 17 percent of all credit used by farmers in 1966 and then steadily dropped to an all-time low plateau of 7.8 percent of all credit in 1971 and 1972. At the same time, short-term credit increased from 59.4 percent of all farm credit extended in 1966 to 72.2 percent in 1971 and then dropped back to 68.6 percent of the total in 1972. Available data on 1973 accounts are still incomplete but they appear to indicate that long-term credit probably increased to about 12 percent of the total credit extended for that year.

[1]Working paper on the Use of Short-term Credit by Quebec Farmers, Economics Branch, Agriculture Canada, Ottawa, Publication Number 73/23.

Intermediate-term credit which represented 23.6 percent of total credit in 1966, decreased to 22.2 percent in 1967 and then further decreased to 14.3 percent in 1968, largely as a result of the chartered banks finding the established FILA rates unprofitable. In 1972, intermediate credit again represented 23.6 percent of all credit extended, the same as in 1966. In Table 5, the data indicate the estimated number of census farms per year for the period 1960 to 1972 in relation to total

TABLE 4. ESTIMATED PERCENT OF FARM CREDIT EXTENDED AND OUTSTANDING BY LENGTH OF TERM, 1960 TO 1972 INCLUSIVE.[a]

	Farm credit extended			Farm credit outstanding		
Year	Long term	Intermediate term	Short term	Long term	Intermediate term	Short term
	percent of total					
1960	11.9	21.3	66.8	29.9	36.6	33.5
1961	12.0	20.2	67.8	31.5	35.0	33.5
1962	11.6	20.2	68.2	32.3	34.0	33.7
1963	11.9	21.1	67.0	33.2	33.6	33.2
1964	13.7	21.6	64.7	34.5	33.8	31.7
1965	15.7	23.4	60.9	36.3	34.2	29.5
1966	17.0	23.6	59.4	38.5	34.0	27.5
1967	16.7	22.2	61.1	39.5	32.9	27.6
1968	14.6	14.3	71.1	41.7	28.0	30.3
1969	11.3	19.2	69.5	40.6	27.4	32.0
1970	8.8	18.8	72.4	41.4	26.3	32.3
1971	7.8	20.0	72.2	39.8	26.5	33.7
1972	7.8	23.6	68.6	37.7	28.2	34.1

SOURCE: R.S. Rust, previously published articles on credit for years 1960 to 1971.

TABLE 5. ESTIMATED NUMBER OF FARMS, FARM RECEIPTS, FARM EXPENSES, NET FARM INCOME, REALIZED NET FARM INCOME, FARM CREDIT EXTENDED, FARM CREDIT OUTSTANDING AND PERCENT CHANGE, CANADA 1960 TO 1972.[a]

Year	Estimated number of farms[b]	Farm receipts[b]	Farm expenses and depreciation charges[b]	Net farm income[b]	Realized net farm income[b]	Farm credit extended[c]	Farm credit outstanding[c]
				— millions of dollars —			
1960	497,822	2,812	2,036	1,196	1,128	1,030	1,583
1961	479,125	2,924	2,082	922	1,195	1,150	1,785
1962	469,058	3,182	2,207	1,526	1,332	1,288	2,018
1963	458,991	3,215	2,362	1,521	1,219	1,461	2,298
1964	448,924	3,504	2,509	1,292	1,378	1,642	2,613
1965	438,857	3,819	2,712	1,567	1,519	1,863	3,004
1966	428,794	4,295	2,994	1,949	1,744	2,022	3,444
1967	416,049	4,383	3,221	1,475	1,626	2,270	3,951
1968	403,304	4,364	3,353	1,710	1,505	2,177	4,105
1969	390,559	4,200	3,443	1,564	1,274	2,169	4,425
1970	377,814	4,208	3,469	1,405	1,344	2,240	4,481
1971	365,068	4,548	3,632	1,651	1,468	2,641	4,714
1972	352,323	5,387	3,881	1,846	2,142	2,976	5,085
Period Change				— percent —			
1960 to 1972	−29.2	91.6	90.6	54.3	89.9	188.9	221.2
1965 to 1972	−19.7	41.1	43.1	17.8	41.0	59.7	69.3

[a]Data on farm receipts, expenses and income from Statistics Canada, Farm Cash Receipts Cat. No. 21.201 Annual and Farm Net Income Cat. No. 21-202 Annual.

[b]Excludes Newfoundland, Yukon and Northwest Territories.

[c]Includes all of Canada.

farm receipts, farm expenses, net farm income, realized net farm income, farm credit extended and credit outstanding on farm accounts. In this table, because of a change in the value of inventories, total net farm incomes were considerably lower than total realized net farm income. In Table 6, the data from the previous table are given on an average per estimated census farm basis, together with the percent change for the two periods 1960 to 1972 and 1965 to 1972.

MISCONCEPTIONS OF AGRICULTURE THROUGH AVERAGING

Average farm receipts, expenses, net income, realized net income, credit extended and debt as shown in Table 6 are apparently more meaningful to many readers than the aggregate amounts in these various accounts as shown in Table 5. Unfortunately, since such averaging requires the use of census farm numbers including a very large number of relatively unproductive farms, some readers, along with readers in other countries have, from past articles, apparently formed a somewhat distorted picture of Canadian agriculture. While the extensive output of Canadian agriculture is generally well known, readers are much less aware of the fact that any rural land holding containing an acre or more of land and from which $50 or more of agricultural products are sold will qualify such holding to be called a census farm. The other factor which many readers are not fully aware of is the fact that many census farms have extremely low production and that such production may be of minor importance to some census farm owners. Consideration is not always given to the fact that census farms may be mainly used by the owners or operators to provide a major source of income; to provide a secondary source of income; to provide a rural residence and associated benefits of rural living; or to provide a means of reducing tax costs or of increasing speculative profits. Without full consideration of these factors, misconceptions of Canadian agriculture, of the country's possible potential in future food production, and of credit requirements to meet the growing demand for food can be greatly underestimated for productive farms. The following discussion is therefore aimed at clarifying some of these misconceptions through the use of certain census and income tax data which, although not necessarily closely related, throw considerable light on the situation.

TABLE 6. ESTIMATED NUMBER OF FARMS, AVERAGE FARM RECEIPTS, OPERATING AND DEPRECIATION CHARGES, NET INCOME, REALIZED NET INCOME, CREDIT EXTENDED AND DEBT, CANADA 1960 TO 1972.

Year	Estimated number of farms[a]	Average farm receipts[a]	Average Operating and Depreciation Charges[a]	Average net income[a]	Average realized farm income[a]	Average farm credit Extended[b]	Average farm debt[b]
				– dollars per farm –			
1960	497,822	5,649	4,090	2,402	2,266	2,061	3,168
1961	479,125	6,103	4,345	1,924	2,494	2,391	3,712
1962	469,058	6,784	4,705	3,253	2,840	2,736	4,286
1963	458,991	7,004	5,141	3,314	2,656	3,171	4,988
1964	448,924	7,805	5,589	2,878	3,070	3,643	5,798
1965	438,857	8,702	6,180	3,571	3,461	4,228	6,818
1966	428,794	10,016	6,982	4,545	4,067	4,697	8,000
1967	416,049	10,535	7,742	3,545	3,908	5,456	9,460
1968	403,304	10,821	8,314	4,240	3,732	5,378	10,142
1969	390,559	10,754	8,816	4,004	3,262	5,535	11,292
1970	377,814	11,138	9,182	3,719	3,557	5,910	11,823
1971	365,068	12,458	9,949	4,522	4,021	7,213	12,875
1972	352,323	15,290	11,015	5,240	6,080	8,425	14,395
Period Change				– percent –			
1960 to 1972	−29.2	170.7	169.3	118.2	168.3	308.8	354.4
1965 to 1972	−19.7	75.7	78.2	46.7	75.7	99.3	111.1

[a]Excludes Newfoundland, Yukon and Northwest Territories.

[b]Averages based on estimated total number of farms in Canada.

Census data for 1971 indicate that 31 percent of census farms produced 77 percent of the total value of farm products sold during the previous 12 months. The apparent very high production of this group of census farms is overbalanced by 69 percent of census farms that produced only 23 percent of the total value of farm products sold.

In 1971, there were 366,128 census farms and of this number 336,175 were individually operated and 21,019 were operated as partnerships. The average number of individuals per partnership is not known. Based on an estimated 2.3 individuals per partnership the total number of individual and partnership farm operators expected to file individual farm income tax was estimated to be 384,519. This does not include 19,200 census farms operated by tenants or the owners of rented land on the 95,862 census farms which were part-owned and part-rented. The maximum number of farm owners who rented their farm land was therefore 115,062, providing these owners did not rent more than one farm. It is probable that many individuals owned and rented more than one farm and some of these rented farms may have been owned by individuals actively operating other farms. Tax officials indicate that it is probable that most census farm owners who rented land and reported rental income and related expenditure on their income tax return had their income classified in tax statistics as "rental" rather than "farming" income. Since slightly over 366,000 individual farm income tax returns were filed in 1971 and because there were 384,519 individual operators of farms that could be expected to file individual farm tax returns, it might be assumed that the filing rate was more than 95 percent. While the filing rate of individual operators of census farms was undoubtedly much lower than this, it only means that an equivalent number of owners of rented land must have filed individual farm income tax returns which were later classified as "farm" rather than "rental" income returns.

In 1971 there were more than 366,000 individual farm income tax returns and of this number 277,319 tax filers were classified as farmers. Since all tax filers are classified into occupational groups in taxation statistics according to their chief source of income the remaining 88,681 farm tax returns must have been classified in one of the other 33 occupational groups.[2] In Table 7, data

[2]In taxation statistics where reference is made to income this refers to income after deduction of expenditures and depreciation, or net income.

TABLE 7. TAXABLE INCOME TAX RETURNS AND TOTAL RETURNS BY OCCUPATIONAL GROUPS REPORTING INCOME FROM FARMING OR FISHING, 1971[a]

Occupations	Farming or fishing income: Taxable returns	Farming or fishing income: All returns	Number of taxable returns	Average taxable income (assessed taxable returns)	Number of non-taxable returns
	— millions of dollars —			— dollars per return —	
Employees					
Employees of businesses	-46.564	-61.947	4,498,737	7,130	1,068,168
Employees of institutions	- 1.225	- 1.659	487,130	5,859	108,094
Teachers and professors	- 2.843	- 3.491	313,202	9,043	28,534
Federal government employees	- 2.376	- 3.460	271,617	8,332	49,433
Provincial government employees	- 4.604	- 6.666	339,229	7,717	55,202
Municipal government employees	- 3.732	- 5.530	306,131	7,530	55,595
Unclassified employees	- 0.250	- 1.384	108,092	4,712	55,028
Total employees	-61.592	-84.137	6,324,138	7,188	1,420,054
Farmers	477.485	598.698	115,384	5,989	161,935
Fishermen	49.076	59.506	10,148	5,782	7,670
Professionals					
Accountants	- 0.053	- 0.094	5,332	18,631	209
Medical doctors and surgeons	- 2.998	- 3.085	20,742	39,555	286
Dentists	- 0.447	- 0.447	5,331	25,828	246
Lawyers and notaries	- 0.547	- 0.556	9,707	27,862	364
Engineers and architects	- 0.094	- 0.105	2,696	21,648	263
Entertainers and artists	- 0.094	- 0.163	6,214	6,763	3,684
Other professionals	- 0.329	- 0.354	14,423	10,836	3,414
Total professionals	- 4.562	- 4.804	64,445	24,588	8,466
Salesmen	- 0.184	- 0.806	19,734	8,766	6,781
Business proprietors					
Forestry operators	- 0.075	- 0.157	1,804	7,335	1,529
Manufacturers	0.156	0.016	9,055	7,899	3,733
Proprietors of construction businesses	- 0.777	- 1.642	43,246	7,482	15,799
Public utility operators	- 0.622	- 2.389	26,123	6,214	16,390
Wholesale traders	0.138	- 0.230	8,127	9,345	2,822
Retail traders	1.744	1.043	91,156	7,792	35,480
Insurance agency operators	- 0.037	- 0.059	1,823	11,586	187
Real estate agency operators	- 0.078	- 0.076	1,992	12,472	509
Proprietors of other financial businesses	- 0.094	- 0.111	1,579	17,429	393
Recreational service operators	- 0.003	0.022	2,936	8,300	1,487
Business service operators	0.004	0.004	2,684	8,142	960
Other service operators	0.055	0.692	60,808	6,456	32,331
Other business proprietors	- 0.232	- 0.303	2,975	7,825	1,701
Total business proprietors	- 0.329	- 4.574	254,308	7,442	113,321
Investors	- 0.284	- 3.625	256,662	7,258	97,467
Property owners	0.170	0.921	58,073	7,566	41,429
Pensioners	- 0.365	- 2.031	256,408	4,385	230,435
Unclassified	- 0.065	- 0.133	13,271	5,455	73,163
Grand total	460.008	557.173	7,372,571	7,237	2,160,721

[a]Department of National Revenue, Taxation Statistics for 1971, Ottawa 1973.

TABLE 8. THE RATIO OF FARM DEBT TO FARM INVESTMENT, CANADA 1960 TO 1972

Year	Farm debt	Investment in farm real estate, machinery and livestock[a]	Debts as a percent of real estate machinery, and livestock investment	Estimated total investment of farmers[b]	Debt as a percent of total investment
		— millions of dollars —			
1960	1,583.0	12,680.0	12.5	14,088.9	11.2
1961	1,785.1	13,159.2	13.6	14,621.3	12.2
1962	2,017.8	13,669.7	14.8	15,188.6	13.3
1963	2,297.6	14,508.5	15.8	16,120.6	14.2
1964	2,613.3	15,744.1	16.6	17,493.4	14.9
1965	3,004.4	17,217.8	17.4	19,130.9	15.7
1966	2,444.2	19,062.7	18.1	21,180.8	16.3
1967	3,950.7	21,069.2	18.8	23,410.2	16.9
1968	4,104.8	22,700.5	18.1	25,222.8	16.3
1969	4,424.8	23,507.5	18.8	26,119.4	16.9
1970	4,480.7	23,801.0	18.8	26,445.6	16.9
1971	4,714.3	23.886.4	19.7	26,540.4	17.8
1972	5,085.8	25,177.8	20.2	27,975.3	18.2

[a]Statistics Canada, Quarterly Bulletin of Agricultural Statistics, Cat. No. 21-003. (Excludes Newfoundland, Yukon and Northwest Territories).

[b]Ninety percent of total investment is estimated to be in farm real estate, machinery and equipment and livestock, and ten percent in other investments.

are presented for all 34 occupational groups indicating the amount of positive or negative income each group received from farming or fishing.[3] While income from other sources is not shown, the average taxable income on taxable returns of each group is presented. The amount of total income does not guarantee a positive farm income since the group which had the highest taxable income had a negative farm income of nearly 3 million dollars.

The average income from farming or fishing of the 227,319 farmers was $2,159 per tax return. If only 115,384 tax filers in the group who had taxable returns are considered, the average income from farming or fishing was $4,138 per return, whereas on the remaining non-taxable returns the average income from this source was $748 per return. If the occupational group of 'fishermen' is omitted, the income from farming or fishing by individuals in the other 32 occupational groups may be assumed to be largely from 'farming' rather than 'fishing'. The estimated negative income in 1971 of these 32 occupational groups from farming or fishing was $101.1 million and a very large proportion of this amount can be attributed to the estimated 88,681 farm tax returns that must have been classified in occupational groups other than that of 'farmers'. It is apparent from the above data, that the averaging of income on a per farm basis for the 366,000 farm income tax filers would result in many misconceptions of Canadian agriculture similar to those that appear to result when other financial data are averaged by using the number of census farms.

The following are the summarized conclusions of the above considerations. In 1971, 31 percent of census farms produced approximately 77 percent of the value of agricultural products sold. At the end of that year, 115,384 farmers, or 31.5 percent of the total estimated number of farmers filing income tax returns, had taxable incomes. More than 44 percent of the remaining farm tax filers, while classified as farmers, did not have taxable returns. The chief source of income of the remaining 24 percent was other than farming and they had a significant loss from their farming operations. It is assumed from this data that the 31 percent of farmers that sold 77 percent of the value of agricultural products are very closely related to the 31.5 percent of farmers that had taxable income tax returns and are undoubtedly closely related to those farmers who used the largest proportion of the farm credit extended in 1971. In order to fully describe the potential production and financial statistics on Canadian farms, new statistical data and studies are especially required concerning the 69 percent of Canadian farms that produce only 23 percent of the farm products sold.

[3]Department of National Revenue, Taxation Statistics (for 1971, Ottawa 1973).

In 1972, 279,714 individuals whose chief source of income was farming reported a net income of $852.5 million from farming or fishing, $175.5 million from wages and salaries and $76.6 million from bond and bank interest. The aggregate net income by this group was $990.7 million on 142,456 taxable returns and $1,241.2 million on all returns. While the aggregate net income from farming or fishing by the 33 non-farmer occupational groups was still negative, their income from this source increased substantially.

The ratio of farm debt to total farm investment increased to 18.2 percent in 1972 compared with a revised estimate of 17.8 percent for 1971 (Table 8).[4] While the increase in farm debt has been substantial in recent years, the increase in relation to the value of total farm investment has been moderate. Between 1960 and 1966, debt as a percent of investment increased by 5.1 percent, whereas between 1966 and 1972 it increased only 1.3 percent.

THE FARM CREDIT SITUATION, 1973

In 1973, realized net farm income increased to $2,706 million from $2,142 in 1972. Income prospects and higher prices for nearly all farm products created an extremely strong demand for credit of all types, but especially for long-term credit. In view of these prospects, and the fact that interest rates remained relatively stable during the spring months, it is not surprising that records were broken in relation to the extent of credit flowing into farming operations. Current estimates indicate that the total credit extended to farmers may have been close to $3,400 million. Farm debt at the end of 1973 probably exceeded $5,400 million. The FCC increased its disbursed loans from $156 million in 1972 to $335 million in 1973. Non-FILA loans to farmers by banks are estimated to have increased by more than $200 million and FILA loans increased from $180 million to $230 million.

EFFECTS OF CHANGES IN THE PRIME RATES OF BANKS ON AGRICULTURE

In 1970, the prime bank rate decreased from 8.5 percent to 7.5 percent during the latter part of the year. Further decreases in 1972 resulted in a 6 percent rate by November of that year and this rate remained at that level throughout 1972 and up to April 1973. Six increases occurred between April 1 and December 31, 1973. During December, the rate was 9.5 percent and

TABLE 9. CHARTERED BANKS PRIME BUSINESS LOAN RATES[a]

Month	1970	1971	1972	1973	1974
			prime rate[b]		
January	8.50	7.00	6.00	6.00	9.50
February	8.50	7.00	6.00	6.00	9.50
March	8.50	6.50	6.00	6.00	9.50
April	8.50	6.50	6.00	6.50	10.50
May	8.50	6.50	6.00	7.00	11.00
June	8.50	6.50	6.00	7.75	11.00
July	8.00	6.50	6.00	7.75	11.50
August	8.00	6.50	6.00	8.25	11.50
September	8.00	6.50	6.00	9.00	
October	8.00	6.25	6.00	9.00	
November	7.50	6.00	6.00	9.00	
December	7.50	6.00	6.00	9.50	

[a]Bank of Canada, Bank of Canada Review for various periods.

[b]Rates are those that pertained on the last Wednesday of each month.

remained at that level until April 1974, when it increased to 10.5 percent. An increase to 11.0 percent occurred in May 1974, and there was a further increase to 11.5 percent in July 1974 (Table 9). The average loan rate of banks is about 2 percent above the prime rate, but this appears to vary somewhat depending on the general circumstances that prevail. In agriculture, the rate usually varies from 1.5 to 2.5 percent above the prime rate with some exceptions on either side of this range.[5] Both financial management ability and agricultural economic prospects have a considerable effect on the rates that farmers are charged.

In the past, when bank lending rates increased, there was usually a time lag of several months in their application to some of the farm credit extended. This was probably due to the fact that many suppliers make their financial arrangements considerably in advance of the time when the credit actually flows into agriculture. However, as general lending rates decline, a compensating lag in lowering rates on agricultural credit also appears to occur. In 1969, the average interest paid on all farm credit used was estimated at 10.1 percent. In 1970, a similar estimate was 9.9 percent, while in 1971 the average decreased to 8.9 percent. In 1972, while the prime rate of banks was 6 percent, the average interest rate on all credit used by farmers was 8.5 percent (Table 1). Federal and provincial activity in agricultural credit has normally helped to slightly lower the average rate on total credit extended, and has had a very significant

[4]Revision due to revised total values of real estate, machinery, and livestock.

[5]While some loan rates to farmers are reported to have been made at or just below the prime rate, it is believed that the number of such loans is relatively insignificant.

effect on the average rate paid on the yearly debt of farmers. Because of the lag effect and relatively low rates on long-term credit, the full effect of the changes in the prime rates of banks in 1973 is not expected to be fully reflected in the average interest rate paid by farmers in 1973, but should be apparent in 1974. With the tighter money situation in 1974, it is probable that the lags in application of interest rate increases to agriculture will tend to decrease. A very substantial increase in the average interest rate paid by farmers has occurred in 1974. While a slight decrease in the prime rate may occur in late 1974 or early 1975, it is unlikely to exceed 1 percent.

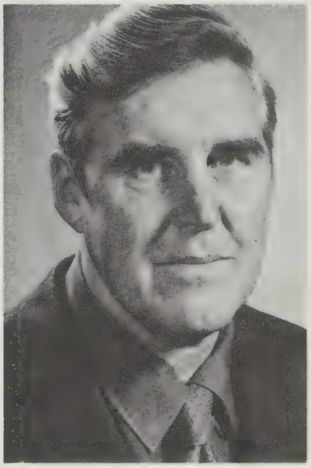
THE FARM CREDIT SITUATION IN 1974

While the general agricultural situation in 1974 has not been as encouraging for many farmers as it was in 1973, a further increase in the use of credit is expected to be recorded. However, the percent increase will probably be less than for 1973. The price of feed grains to livestock producers and the rapid increase in the cost of farm machinery, fertilizers, and other purchased inputs have had a significant effect in narrowing the profit margins that many farmers enjoyed a year earlier. While land prices have been increasing rapidly in most areas, the comparatively low interest rates available encouraged further consolidation of farms and, together with the optimism generated in 1973, resulted in a strong demand for a long-term credit. It would appear that FCC loans for 1974 will be well in excess of $400 million. However, in the intermediate-term range there is less certainty of the amount of credit being extended. A very significant decrease in FILA loans, perhaps similar to the 1968 pattern, occurred during the early part of the year due to the established formula rates being unprofitable to banks. An Order-in-Council of August 6 authorized banks to charge 9.75 percent on all FILA loans made up to September 30. This encouraged loaning activity but was not considered profitable by most banks. The formula rate on both 1 to 5 year and 5 to 10 year bonds was approximately 10 percent at the end of September. As a consequence, a 10-percent rate was established for all FILA loans. The current rate on Farm Credit Act loans is $9^1/_4$ percent but for syndicate loans the rate is 10 percent. While loans for the purchase of machinery and equipment may have increased substantially in 1974 partly because of price increases, other credit in the intermediate-term range, except for mortgages held by former farmers may have decreased slightly. A relatively small increase in short-term credit extended to farmers is believed to have occurred in 1974. Interest rates and both intermediate and short-term credit increased substantially during the year and have undoubtedly had some effect on demand.

Price and wage inflation, persisting over a long period of time, tends to develop the expectations of individuals that such inflation will continue indefinitely. Very rapid inflation not only results in inflation allowances being built into many lending rates, but also makes borrowers, including farmers, less concerned about interest rate increases. Disregarding the effect that increasing farm costs may have had on farmers, the very large increase in farm cash receipts for the January-June 1974 period of $4,683.2 million, compared with $2,828.3 million for the same period in 1973, has undoubtedly made many farmers less hesitant towards borrowing at high interest rates. The many uncertainties and instabilities that currently exist in the national and international financial world suggests that increased caution by farmers in becoming indebted at high interest rates is warranted.

FARM ADJUSTMENTS ASSOCIATED WITH THE ARDA FARM ENLARGEMENT AND CONSOLIDATION PROGRAM IN NOVA SCOTIA

One of the most significant of the ARDA programs, from the point of view of farm adjustment, was that conducted under the Farm Enlargement and Consolidation Program. Study farmers who acquired an average of 187 acres of land on a rental basis emphasized the advantages of securing land without borrowing and associated benefits, including increased employment, income, farm viability, retention of sons in agriculture, and the overall effect of putting unproductive land back into farm production.



G.C. Retson *

INTRODUCTION

Federal-Provincial cost sharing agreements under the Agricultural Rehabilitation and Development Act (ARDA) have provided the basis for a wide range of programs involving alternative uses of land, soil and water conservation and the development of income and employment opportunities in rural areas. From the point of view of farm adjustment, one of the most significant of these programs was that conducted under the ARDA Farm Enlargement and Consolidation Program. Farm enlargement agreements were implemented by all but four provinces in Canada, with total expenditures amounting to approximately $35 million during the 1965-71 period.

While agreements entered into by participating provinces differed slightly in detail, the program's basic purpose and rationale were those of increasing farm income and viability through farm enlargement. Since land most readily available for enlargement was usually that operated as small or uneconomic farms, a further effect of the program was that of reducing the number of such units. As title to land purchased under the program was initially vested in the Crown, a further feature of the program was that it facilitated the acquisition of land for conservation or for other aspects of land use planning.

As small farms tend to be most prevalent in Eastern Canada, the program had special application in the Eastern Provinces. Farmer and area participation reflected local demand for farm land and the supply available at a cost of not more than $100 per acre, the maximum purchase price stipulated in all agreements. In the better farming areas, land values in excess of this amount restricted or virtually eliminated operation of the program.

An ARDA farm enlargement project proposal, officially referred to as "Project 2201 - Farm Consolidation and Land Use", was submitted by Nova Scotia and approved by the Federal Government in 1965. The project was administered by the Nova Scotia Land Settlement Board and during its operation from August, 1965 to March 31, 1971, a total of 784 properties were acquired by 537 farmers in the province. The purpose of this article is to describe and analyze its operations and the nature and extent of farm adjustments associated with this program.

OPERATION OF THE PROGRAM

Objectives and administrative aspects of the program as outlined in a statement issued by the Nova Scotia Department of Agriculture and Marketing were:

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(1) to acquire farm land and uneconomic woodlot holdings as they may become available;

(2) to place the acquired land at the disposal of farmers who have exhibited a degree of competence and managerial ability which will tend to insure the success of an expanded unit;

(3) to consolidate land into units of economic size;

(4) to place land in other uses; and

(5) to hold land in a conservation reserve.

Under Farm Consolidation and Land Use, the Nova Scotia Land Settlement Board can purchase additional land resources for eligible farmers, said lands being leased to the applicant for a period of 5 years. The lessee will pay the taxes and, if there are any buildings on the land, the fire insurance. In addition, he will pay, at a graduated rate, a percentage of the original purchase price of the land, 1 percent during the third year, 2 percent during the fourth year, and 3 percent during the fifth year.

At the end of the 5-year period, the lessee has the option of releasing the land at a cost of the taxes, (fire insurance if applicable), and 5 percent of the original purchase price or of purchasing the land at a reasonable market value, the maximum price having been stated in the lease agreement.

If necessary, loans for purchase may be arranged under the Loan Policy of the Board if the property is to be purchased by the lessee, or by some other loan agencies such as the Farm Credit Corporation.

Assistance is also provided in the improvement of the cultivated acreage as follows:

1. If drainage is necessary, up to a maximum of $10 for each acre of cultivated acreage can be made available.

2. Assistance in the purchase of lime and fertilizer can be made available to ensure that the fertility is sufficiently high to provide a reasonable level of production. The maximum grant available is up to $50 for a cultivated acre, including the cost of drainage if necessary.

3. Assistance in the development of a soil management program will also be provided.[1]

Selecting the property to be purchased and securing an agreement of sale from the prospective vendor were the responsibility of the applicant. On approval of application, the property was appraised by the Board. If the asking price was within 10 percent of the appraised value and the property contained a minimum of 20 acres of land located within 4 miles of the home farm, it was purchased by the Board and leased to the applicant.

Participation in the Nova Scotia program (7 percent of census farms) appears to have been one of the highest, if not the highest, in Canada. Contributing factors were the need for farm enlargement as indicated by the size of farm in Nova Scotia (50 improved acres per farm in 1966 as compared with the national average of 251 acres) and opportunities for farm enlargement, both in terms of available land and the cost of acquiring it (Table 1). The Nova Scotia Department of Agriculture has been engaged in Farm Credit operations for more than 40 years.

[1] Farm Consolidation and Land Use, ARDA, Canada, Nova Scotia, 1965-1970.

TABLE 1. NUMBER, AREA AND VALUE OF CENSUS FARMS IN PROVINCES PARTICIPATING IN THE ARDA FARM ENLARGEMENT AND CONSOLIDATION PROGRAM, 1966-71

	Number of Farms		Area per Farm				Value per Acre Land and Buildings	
			Total Land		Improved Land			
	1966	1971	1966	1971	1966	1971	1966	1971
	—number—		—acres—				—dollars—	
Alberta	69,411	62,702	706	790	393	454	58	71
Ontario	109,887	94,722	162	169	109	115	194	325
Quebec	80,294	61,257	160	176	95	105	90	122
New Brunswick	8,706	5,485	208	244	73	89	51	80
Nova Scotia	9,621	6,008	192	221	50	64	56	100
Prince Edward Island	6,357	4,543	146	171	90	109	78	132
Canada	430,522	366,128	404	463	251	295	76	100

Source: Census of Agriculture — 1966 and 1971.

STUDY FARMS

While farmer participation was significant, a more specific measure of the success of the program was its influence on farm adjustments and associated changes in farm organization and income. To analyze related developments, data were secured from a sample consisting of 111 farm operators who acquired land under the project. Stratified random sampling procedures were used with the number of operators drawn from each county in the province proportional to county participation in the provincial program.

The 111 farmers acquired a total of 182 farm properties containing 20,754 acres of land or an average of 1.6 properties and 187 acres for each operator under the program. Data were secured on farm capital and operations conducted by these farmers before their first ARDA farm acquisition and following termination of the program in 1971. Additional information on each farmer's experience, problems, and recommendations regarding farm enlargement provides a further basis for evaluation of the program.

FARM CAPITAL

Prior to their ARDA acquisitions, study farms had an average investment of $35,524 for each farm in land and buildings (Table 2). Of this, $32,888 was owned and $2,636 was rented. During the 1965-71 period they acquired ARDA properties with a value of $10,552 a farm, purchased other farms at $1,030 each and rented additional land worth $3,277 for each farm. As a result of these acquisitions, total investment in real estate rose from $35,524 to $72,341 per farm, an increase of 104 percent in the 1965-71 period. While the major expansion was in real estate, operators also increased their investment in both livestock and machinery by more than 90 percent.

As indicated by the data in Table 2, there was some variation in the relative increases in various items of farm capital. Major increases occurred in tillable land and farm barns. Investment in farm houses and woods increased, but at a lower rate. Increased investment in tillable land reflects the influence of additional acreage, rising land values and the $50 an acre ARDA improvement grants for cultivated land. Investment in woodland increased, but as returns from forest products were relatively low during much of the 1965-71 period, the rate of increase was lower than for other types of land. Increased investment in barns reflects expanded livestock operations and rising construction costs. Various factors contributed to the relatively low percentage increase in investment in farm houses. A number of vendors sold their land but retained the farm home. Some operators were not interested in acquiring the farm house and arranged to have it sold subsequent to purchase of the farm by the Farm Loan Board. In some cases the acquired property did not include a house.

FARM DEBTS

To finance the capital and current expenditures associated with farm enlargement, 105 of the 111 study

TABLE 2. CHANGES IN CAPITAL INVESTMENT ON 111 FARMS ACQUIRING PROPERTY UNDER THE ARDA FARM CONSOLIDATION AND LAND USE PROGRAM IN NOVA SCOTIA, 1965-71

	Capital Investment Prior to ARDA Acquisitions			ARDA Acquisitions 1965-71	Capital Investment in 1971					1971 Investment as Percentage of Pre-ARDA
	Owned	Rented	Total		Initially Owned Farm	Acquired Other Than via ARDA	Rented	ARDA Farms	Total	
	—dollars per farm—									—percent—
Houses	7,450	–	7,450	1,659	10,397	266	–	2,321	12,984	174
Barns	8,492	–	8,492	1,865	15,166	180	–	2,958	18,304	216
Other buildings	3,223	–	3,223	417	5,438	–	–	934	6,372	198
Total buildings	19,165	–	19,165	3,941	31,001	446	–	6,213	37,660	197
Tillable land	10,588	2,484	13,072	5,228	14,925	436	3,024	10,206	28,591	219
Other land	3,135	152	3,287	1,383	3,651	148	253	2,038	6,090	185
Total land	13,723	2,636	16,359	6,611	18,576	584	3,277	12,244	34,681	212
Total real estate	32,888	2,636	35,524	10,552	49,577	1,030	3,277	18,457	72,341	204
Machinery and equipment	11,519	–	11,519	–	22,103	–	–	–	22,103	192
Livestock	14,491	–	14,491	–	28,223	–	–	–	28,223	195
Total	58,898	2,636	61,534	17,163	99,903	1,030	3,277	18,457	122,667	199

TABLE 3. CHANGES IN FARM DEBTS AND SOURCES OF CREDIT ON 111 FARMS ACQUIRING PROPERTY UNDER THE ARDA FARM CONSOLIDATION AND LAND USE PROGRAM, NOVA SCOTIA 1965-71

Source of Credit	Farm Indebtedness Prior to ARDA Acquisition: Farms with Loans	Loan Value: Per Farm Reporting	Loan Value: Average 111 Farms	Farm Indebtedness 1971: Farms with Loans	Loan Value: Per Farm Reporting	Loan Value: Average 111 Farms	1971 Debt as Percentage of Pre-ARDA
	number	—dollars—		number	—dollars—		percent
Nova Scotia Farm Loan Board	64	16,760	9,663	83	27,442	20,520	212
Farm Credit Corporation	19	23,188	3,969	19	34,304	5,872	148
Banks	60	3,216	1,738	39	10,126	3,558	205
Farm Improvement Loans	35	2,989	943	40	4,145	1,494	159
Finance Companies	10	1,806	163	6	4,019	217	134
Other	18	2,606	423	18	5,166	838	198
Total or Average	98	19,140	16,899	105	34,356	32,499	192

farms required additional credit. As a result, the total farm dept in 1971 of $32,499 for each farm was almost double that in 1965 (Table 3). The major source of credit was the Nova Scotia Farm Loan Board whose loans accounted for 63 percent of the total indebtedness on study farms in 1971.

LAND USE

Since land provided the main basis for enlargement, the more obvious adjustments on study farms were those associated with land use and crop production. Before their first ARDA acquisition, study farms had an average of 97 acres in crops, 66 acres in pasture and 152 acres in woods (Table 4). By 1971 they had increased the total farm acreage from an average of 315 acres to 511 acres a farm and had made a number of adjustments in crop production.

A comparison of pre-ARDA and 1971 data indicates substantial increases in corn, tobacco and grain with the 1971 acreages ranging from double to nearly six times

TABLE 4. CHANGES IN CROP PRODUCTION AND LAND USE ON 111 FARMS ACQUIRING PROPERTY UNDER THE ARDA FARM CONSOLIDATION AND LAND USE PROGRAM IN NOVA SCOTIA, 1965-71

Crop or Land Use	Prior to ARDA Acquisition: Farms Reporting	Average Acres: Per Farm Reporting	Average Acres: 111 Farms	1971: Farms Reporting	Average Acres: Per Farm Reporting	Average Acres: 111 Farms	1971 as Percentage of Pre-ARDA
	number	—acres—		number	—acres—		percent
Grain	71	25.5	16.3	69	53.7	33.5	206
Hay	109	70.8	69.6	108	99.1	97.1	140
Corn	12	29.9	3.2	45	48.6	18.9	586
Potatoes	2	71.0	1.3	2	75.0	1.4	106
Tobacco	2	14.5	0.3	2	54.5	1.0	376
Vegetables	14	10.1	1.3	8	14.4	1.0	81
Tree fruit	27	15.6	3.8	19	27.4	4.7	124
Small fruit	7	12.0	0.7	9	10.4	0.5	69
Other crops	3	33.0	0.9	14	29.6	4.1	456
Total crops	111	97.4	97.4	111	162.2	162.2	167
Tillable pasture	98	50.6	44.7	105	72.9	69.0	154
Rough pasture	47	50.5	21.4	77	56.3	39.0	182
Woods	103	163.5	151.7	108	247.4	240.7	159
Total Land	111	315.2	315.2	111	510.9	510.9	162

those prior to participation in the enlargement program. While there was an expansion in acreage of hay, and to a lesser extent in tree fruit and potatoes, percentage increases were less than those in total crop land or total farm land. The percentage increase in "other crops", while large, was not too significant as the acreage involved was relatively small and consisted mainly of summerfallow or green manure crops on farms acquired late in the season. In the case of small fruit and vegetables, acreage declined.

A comparison of pre-ARDA and 1971 data indicates relatively little change in the ratio of tillable land to that in rough pasture and woods. The largest percentage increase in non-tillable land was in rough pasture. Some of the farms purchased under the program were in a run-down condition, and with tillable land reverting to rough pasture, the relative acreage in this type of land tended to be higher than in pre-ARDA operations.

Adjustments in crop programs on study farms reflect the fact that these operators were engaged mainly in livestock operations, and above average expansion in crops such as corn and grain, combined with substantial increases in hay and pasture, provided the basis for herd expansion, much of which was in dairy and beef. Expansion in these crops, and also in tobacco, reflects adjustments by the more innovative farm operators in the province. Below average increases or declines in acreages of potatoes, vegetables and fruit reflect stationary or declining trends in acreage of these crops in Nova Scotia during the 1965-71 period, plus the fact that ARDA improvement grants were not available for orchard land.

Data on land-use also provide some indication of the type of operators participating in the program. Since its purpose was to increase viability through enlargement, the program presumably should have been of major interest and benefit to small farm operators. While the sample did include some small farms, the scale of operations (pre-ARDA average 315 acres a farm) was well above the average for the province. A further characteristic of study farm operators was their obvious interest in farm enlargement. Prior to their first ARDA acquisition, 57 of the 111 farmers operated rented land besides their owned farms. Despite substantial additions under ARDA, 59 of them rented additional land in 1971 and in larger amounts than in 1965. Furthermore, expansion during the 1965-71 period was not confined wholly to acquisitions under ARDA, as 22 operators purchased additional farms over and above those secured via this program.

LIVESTOCK

Farm enlargement was associated with increased specialization, size of unit and some reorganization of livestock enterprises on study farms (Table 5). Numbers of dairy cows increased by 52 percent, but there was a reduction of 5 percent in the number of farms reporting dairy cattle. With the acquisition of additional land, a number

TABLE 5. CHANGES IN LIVESTOCK NUMBERS AND FARMS REPORTING LIVESTOCK ON 111 FARMS ACQUIRING PROPERTY UNDER THE ARDA FARM CONSOLIDATION AND LAND USE PROGRAM IN NOVA SCOTIA, 1965-71

	Prior to ARDA Acquisition			1971			
		Average Livestock			Average Livestock		
Livestock	Farms Reporting Livestock	Per Farm Reporting	111 Farms	Farms Reporting Livestock	Per Farm Reporting	111 Farms	1971 Livestock as Percentage of Pre-ARDA
	—		number			—	percent
Dairy cows	88	29.2	23.1	78	49.7	35.0	152
Beef cows	19	26.5	4.5	30	29.3	7.9	176
Heifers	100	14.9	13.4	98	24.9	22.0	164
Steers	51	22.2	10.2	42	36.7	13.9	137
Calves	96	12.6	10.9	95	19.3	16.5	152
Bulls	20	1.4	0.2	56	1.7	0.9	352
Total Cattle	104	66.6	62.4	104	102.5	96.0	154
Sows & boars	15	17.6	2.4	13	36.2	4.2	178
Market hogs	35	132.8	41.8	19	214.9	36.8	88
Hens	20	2,047.4	368.9	14	3,206.1	404.4	110
Broilers	3	11,708.3	316.4	2	12,500.0	225.2	71
Sheep	6	82.5	4.5	8	156.5	11.3	253

of the smaller dairy herds were replaced with beef. Numbers of beef cows increased by 76 percent while steers were up 37 percent. There was a slight increase in farms reporting sheep, and flock numbers increased by 153 percent during the 1965-71 period.

There was some increase in the size of unit, but total numbers of hogs and poultry as well as farms reporting these enterprises declined. The production of hogs and poultry in Nova Scotia was based largely on imported rather than home grown feed and capital requirements for these enterprises were mainly for buildings rather than land. The program was therefore of less interest to hog and poultrymen, particularly when returns from these enterprises were relatively low.

LABOR

Expanded operations associated with farm enlargement resulted in increased requirements for labor; total labor input on study farms increased by 20 percent during the 1965-71 period (Table 6). Major increases occurred in employment of sons and hired workers. The slight

TABLE 6. CHANGES IN EMPLOYMENT ON 111 FARMS ACQUIRING PROPERTY UNDER THE ARDA FARM CONSOLIDATION AND LAND USE PROGRAM IN NOVA SCOTIA, 1965-71

	Time Spent on Farming Operations		1971 Employment as Percentage of Pre-ARDA
	Prior to ARDA Acquisition	1971	
	— weeks a year —		percent
Operators	49.5	49.8	101
Wives	6.1	6.4	107
Sons	15.2	23.8	156
Other family	7.1	7.6	107
Hired workers	30.4	42.6	140
Total	108.3	130.2	120

TABLE 7. CHANGES IN FARM CASH RECEIPTS ON 111 FARMS ACQUIRING PROPERTY UNDER THE ARDA FARM CONSOLIDATION AND LAND USE PROGRAM IN WESTERN, CENTRAL AND EASTERN NOVA SCOTIA, 1965-71

	Farm Cash Receipts Prior to ARDA					Farm Cash Receipts 1971					1971 Receipts as Percentage of Pre-ARDA
	West	Central	East	All Farms		West	Central	East	All Farms		
Number of farms	53	43	15	111		53	43	15	111		
	— dollars per farm —				—percent—	— dollars per farm —				—percent—	—percent—
Livestock farms											
Cattle	4,211	2,013	1,051	2,932	12.5	13,127	3,750	1,619	7,939	20.0	271
Swine	3,522	6,132	700	4,152	17.7	1,751	8,257	208	4,063	10.3	98
Poultry	2,125	139	200	1,095	4.7	2,151	48	—	1,046	2.6	96
Sheep	28	88	53	55	0.2	72	181	56	112	0.3	204
Total Livestock	9,886	8,372	2,004	8,234	35.1	17,101	12,236	1,883	13,160	33.2	160
Livestock Products											
Milk	9,562	8,030	9,284	8,931	38.1	21,579	17,625	21,017	19,971	50.5	224
Eggs	4,547	902	1,838	2,769	11.8	831	2,294	1,667	1,511	3.8	55
Other	5	16	7	9	0.004	2	33	2	14	0.04	156
Total Livestock Products	14,114	8,948	11,129	11,709	49.9	22,412	19,952	22,686	21,496	54.3	184
Crops											
Tree fruit	1,676	—	—	801	3.4	2,357	—	—	1,126	2.8	141
Small fruit	468	385	—	372	1.6	530	512	—	451	1.2	121
Grain & hay	103	41	8	66	0.3	327	418	86	329	0.8	498
Potatoes	645	2	—	309	1.3	947	—	—	452	1.1	146
Vegetables	329	290	—	270	1.2	148	442	—	242	0.6	90
Tobacco	536	—	—	256	1.1	1,796	—	—	858	2.2	335
Total Crops	3,757	718	8	2,074	8.9	6,105	1,372	86	3,458	8.7	167
Forest products	165	212	520	231	1.0	364	445	600	427	1.1	185
Custom work	321	143	—	209	0.9	314	300	—	266	0.7	127
Off farm work	1,266	406	425	819	3.5	142	582	503	363	0.9	44
Miscellaneous	171	217	—	166	0.7	299	769	—	441	1.1	266
Total	29,680	19,016	14,086	23,442	100.0	46,737	35,661	25,758	39,611	100.0	169

growth in operator labor reflects a reduction in time spent on off-farm employment which declined from 2.3 to 1.4 weeks a year. The most significant effect of farm enlargement in relation to the farm labor force was probably the increased employment and retention of farmers' sons in agriculture.

CASH RECEIPTS

Farm enlargement was associated with a 69-percent increase in cash receipts on study farms. Data on cash receipts which were analyzed on a regional basis (Table 7) provide additional information on adjustments associated with farm enlargement and a measure of their combined influence on farm income.

Prior to participation in the enlargement program 62 of the 111 study farms secured more than one half of their cash receipts from dairying. Twenty-six other operations classified as mixed farms also kept some dairy cattle. By 1971, the number of specialized dairy farms had increased to 68, and sales of fluid milk accounted for more than one half of the total cash receipts on the 111 farms. While specialized dairy farms increased their output, dairy operations on mixed farms tended to decline. By 1971, 10 of the mixed farms had disposed of their dairy cattle, and of these, nine had converted to beef. Seven farms, which had no beef cattle on hand before farm enlargement, combined beef with dairy cattle in 1971 or were in the process of converting from dairy to beef. Farm enlargement was thus associated with increased specialization and output on dairy farms, but with a move out of dairy into beef on mixed farms.

Farm enlargement was associated with a 104-percent increase in cash receipts for sheep but with a decline in livestock numbers, cash receipts, and farms keeping hogs and poultry during the 1965-71 period. Sheep, like beef and to a lesser extent dairy, are land-based operations in Nova Scotia. Production of hogs and poultry, however, is based mainly on purchased rather than home grown feed. The tendency to expand land-based enterprises during farm enlargement was further emphasized by the fact that other farms in the province were expanding hog and poultry numbers during this period.

Farm enlargement was associated with considerable variation in cash receipts from other enterprises, but the relationship was in some cases less apparent. Above average increases occurred in cash receipts from hay, grain, tobacco and forest products. While farm enlargement resulted in greater production of hay and grain, increased sales of these crops appeared more directly related to the fact that feed production tended to expand more rapidly than livestock numbers, resulting in a temporary crop surplus available for sale. A rapid expansion in tobacco was underway in Nova Scotia during the 1965-71 period, and while not a major contributing factor, farm enlargement presumably facilitated this development. The increase in cash receipts from forest products is more directly related to farm enlargement, and reflects the fact that some of the farms acquired under ARDA had not been intensively operated for some years. The resultant tree growth, plus additional acreage in woodland, provided an opportunity for woods work as well as a need for land clearing operations. Below-average increases or declines in cash receipts from fruit, potatoes and vegetables reflect the influence of relatively low returns from some of these crops during the 1965-71 period and possibly less emphasis on intensive crops as a result of farm enlargement. The decline in off-farm work is directly related to increased on-farm operations resulting from farm enlargement.

Data in Table 7 indicate considerable regional variation in sources and amounts of cash receipts as well as farmer participation in the enlargement program. Farmer participation in Eastern Nova Scotia was less than in Western and Central areas of the province, and was confined mainly to expansion in fluid milk production. Sales of milk more than doubled in the central and western regions, but farms in these areas had a more diversified program of expansion. While there was some regional variation in percentage changes in cash receipts, patterns of adjustment for all classes of livestock were similar, except for hogs, which increased in Central Nova Scotia, but declined elsewhere.

PROBLEMS IN FARM ENLARGEMENT

The preferred arrangement in farm enlargement is usually to acquire an adjoining or contiguous property which can be combined with the home farm operation. Of the 182 properties purchased by study farms, 100 were adjoining operations. The remaining 82 properties were located at an average distance of 2.5 miles from home farms, well within the 4 mile limit stipulated in the program. There was some regional variation, with ARDA properties in Central Nova Scotia located at an average distance of 0.9 miles from the farm, while in Western and Eastern Nova Scotia the average distance was 1.3 miles. Since distance from the home farm tends to increase management problems and production costs, operators were asked to comment on related problems and action taken to minimize them.

Operators listed proximity and price as two major considerations in farm selection. With locations beyond a mile, there was a noticeable increase in problems listed

and awareness and concern over them. These included the operation of slow-moving vehicles on or across highways, restrictions in the use of under-age drivers, increased demands on the wife to transport workers in the family car, difficulties in moving bulky loads such as forage and manure, being cut off from the ARDA farm by limited access highways, added problems of snow removal and the combined influence of these and other factors on labor requirements and production costs.

Efforts to reduce these problems consisted mainly of improvements in transportation and re-organization of the farm business. These included the purchase of additional or heavier trucks, greater concentration of forage crops on the home farm, and the relocation of fences to increase the size of fields and reduce time and travel.

ASSISTANCE GRANTS

Farms taking part in the program were eligible for a grant of $50 per cultivated acre on ARDA properties for improvements in drainage, lime and fertilizer. As of December 31, 1971, a total of $397,477 in grants had been paid to the study farms, of which 5 percent was used for drainage, 18 percent for lime and 77 percent for fertilizer. There was also an unused balance of $46,529. Farmers noted that the grant had aided in getting land on leased properties back into production, providing early and additional income for other needed improvements. Operator financed improvements, which amounted to $145,780, included a number of items, those most frequently listed being drainage, land clearing, breaking up and reseeding old fields or pastures, additions and repairs to buildings or fences, and bulldozing out hedgerows and expanding fields. Fourteen of the operators also indicated that they had made additional purchases of lime and fertilizer over and above those available through the grant.

Provision of grants (cost of which was shared by the Federal and Provincial Governments) was a factor influencing farmer participation in the program. While 92 of the 111 study farm operators would have acquired ARDA properties regardless of the grant, 19 said that they could not or would not have participated in the program without the grant. The main reasons for this were lack of capital and the high cost of bringing run-out land back into production. Without the grant, it was indicated that rehabilitation of many of the ARDA properties would have been a long, slow process. While reaction to the grant was highly favorable, there was some suggestion that it should have been more flexible with provision for improvements other than for drainage, lime and fertilizer. Fruit growers were also critical of the fact that orchard was not classified as cultivated land and was ineligible for the grant. Only one operator was opposed to the grant as he felt it encouraged land speculation.

VENDORS

Sale of a farm is usually associated with changes in occupation, location and adjustment problems for the vendor. It is therefore frequently suggested that governments initiating or promoting enlargement should also provide some assistance for those displaced from agriculture as a result of such programs. To secure information on related problems, reasons for selling and characteristics of vendors, data were secured from a sample of 75 former owners of properties acquired by study farms. Wherever possible, information was secured directly from the vendor; however, as some of the vendors had died or moved from the area following sale of the farm, only partial data were available in some cases.

As land values were rising during the 1965-71 period, it was assumed that some of the vendors might regret the sale of their property and as a result of this, and lack of assistance in relocation, would tend to be critical of the enlargement program. Analysis of comments secured from vendors, however, indicated that most of them were well pleased with the program. Contributing factors were a desire to retire from active farming because of age or ill health, satisfaction over the fact that their land would remain in agriculture, and assistance provided by the Farm Loan Board in transfer of title and payment for farms, a number of which had been for sale for some time.

Data secured on the 75 vendors early in 1972 indicated that 34 were retired, five were farming and 24 were engaged in a variety of non-farm jobs including trucking, school bus operation, clerical work, school teaching and general labor. Six vendors had died, and no information on current occupation or location was available for six others. Forty of the 75 vendors had retained part of their farms (usually the house and a few acres of land) and a number were conducting some farming operations. The fact that a considerable number were located on or near their farms was probably a further factor in their favorable reaction to the enlargement program.

Vendors, or those reporting for them, listed age (24), ill health (9), or a combination of both (6), as the main reasons for selling the farm. The average age of those reporting was 64 years and, as this did not include data for the six vendors who had died, the average age for the group was probably somewhat higher. In the case of 22 vendors, sale of the farm resulted from, or was asso-

ciated with, some aspect of non-farm employment. Related comments included a preference for non-farm work, low income from farming, inadequate capital or size of farm, and the fact that the farm was located too far from the off-farm job. Eight of these vendors were non-farmers who had acquired their properties through inheritance or for speculative purposes and were not farming the land at the time of sale. The remaining 11 vendors included four widows who were unable to carry on farming following the death of their husbands, three vendors who had sold off only part of their land and were continuing in farming, and one operator who had sold his farm in order to purchase a larger one.

As 41 vendors were living on ARDA farms in 1972, study farm operators were asked to comment on the advantages, disadvantages, or problems associated with this arrangement. Related comments were largely in terms of the advantages or disadvantages of acquiring the ARDA farm house. The main advantage of vendors leaving the property was that farmers would have the use of the house for sons or extra hired labor required in their expanded operations. If the house was not required, it could be sold and the proceeds applied as a reduction to the purchase price and rental fee for the ARDA farm.

Two advantages of vendors remaining on the farm were their value as a potential source of labor and the desirability of having someone who "could keep an eye on things", particularly where the ARDA farm was located at some distance from the home farm. Where the vendor retained title to the house, it was recommended that a clause be included in the deed giving the purchaser first choice of acquiring the house when no longer required by the vendor. Through this arrangement, the operator could acquire the house at a later date if desired, and control any subsequent sale of it.

FUTURE PLANS FOR ENLARGEMENT

Eighty-one of the 111 study farmers expected to continue their program of farm enlargement, but with some reservations. All would clear currently owned woodland, while 48 would also acquire additional land, preferably under an extension of the ARDA program. Thirty-two added a provision that land purchased would have to be located in close proximity to the home farm, while 21 made the further comment that in future acquisitions, more emphasis would be placed on securing property with a high percentage of the acreage in improved land. Additional improved land would be used mainly to increase acreage in feed crops with 47 operators planning an expansion in hay, 44 in pasture, 40 in corn and 26 in grain. Expansion in corn, however, would be offset by reductions in grain (11 farms) and hay (10 farms). Six operators planned an increase in fruit, but another three would reduce acreage in such crops. Two farmers planned to increase acreage in vegetables.

Planned expansion in livestock was confined mainly to dairy and beef with 51 farmers planning an increase in dairy cows, while 27 would increase beef cows. Twenty-one farmers also planned to increase herd size by raising more dairy heifers for replacement or sale, while 27 others would increase the number of steers or heifers kept for beef. Fifteen other dairy farmers intended to keep about the same number of cows, but expected to increase sales of milk through higher production per cow. Seven farmers planned to increase hogs, but three would cut back on hog production. Four operators planned to increase the size of their sheep flocks but only two intended to expand in poultry production.

Three farmers planned to increase off-farm work, but three others would reduce such operations as a result of their expanded livestock operations. Expansion in off-farm employment would be mainly in the form of custom work, and used to offset heavy expenditures for equipment. Eleven farmers planned to increase woods operations, but five others would cut back on such work as a result of expansion in livestock and difficulties in securing labor for woods work.

FARMER EVALUATION OF THE PROGRAM

As a final question, farmers in the study were asked to evaluate the farm enlargement program and to comment on, or suggest any revisions, which should be incorporated in it. Of the 111 farmers, 106 described it as a "good", "valuable" or "excellent" program, and 12 added that it was "the best farm program ever introduced by the Department of Agriculture." A further comment of 88 operators was that it should be renewed or continued. Reference was made to the advantages of being able to acquire land without borrowing, its influence in putting unused or non-productive farm land back into production and related benefits of increased employment, income and farm viability. As a method of farm expansion, it represented a preferable alternative to clearing owned land, and a further benefit of the enlarged operation was that "it helped to keep sons on the farm."

A major criticism and suggested revision of the program by those interviewed was that it should be limited to "full-time farmers" (16 mentions). Reference was made to purchases of land by corporations and hobby farmers, or by speculators and non-resident buyers who acquired

farm land and subsequently let it revert to bush. Such purchases, combined with those via ARDA, were bidding up land prices, and full-time operators should be given priority over part-time farmers in the long-term interests of farming. A further related comment was that governments should make more utilization of conservation provisions in the policy, and should be involved in land banking programs to acquire land for agriculture as it becomes available. Four farmers said that the $100 an acre maximum price for purchase of land was too low, while two others questioned the restriction on purchases of less than 20 acres and the further requirement that land acquired under the program be located not more than 4 miles from the home farm.

Other comments and recommendations were largely in reference to improvement grants. Most of these comments were prefaced with the remark that improvement grants had been a great help in getting the land back into production, but that greater flexibility should be permitted in their use. Six farmers said that the amount spent on drainage should not be restricted to 10 percent of the total grant, while 16 others stated that use of the grant should be extended to include expenditures on building repairs, and clearing operations on fence rows, old orchard and rough pasture. Three fruit growers also said that orchard should be classified as cultivated land in determining the amount of the grant. Thirteen farmers stated that improvement grants should be higher, but four others felt that if $50 per cultivated acre was insufficient, the land probably should not have been purchased. As previously noted, one farmer was opposed to the grant because it encouraged speculation; another was in favor of the grant, but suggested an annual check to ensure that land acquired under the policy was improved and utilized to its full potential.

SUMMARY AND CONCLUSIONS

Data secured from sample groups of vendors and farmers participating in the ARDA farm enlargement program in Nova Scotia indicated that this was a very popular program. Study farmers who acquired an average of 187 acres of land on a rental basis emphasized the advantages of being able to secure land without borrowing and associated benefits including increased employment, income, farm viability, retention of sons in agriculture, and the overall effect of putting unproductive or unused land back into farm production. Enlargement was associated with considerable reorganization of the farm business including increased specialization on dairy farms, a movement from dairy into beef on mixed farms, a substantial increase in crop and livestock production and a 69-percent increase in cash receipts on study farms during the 1965-71 period. A major factor contributing to the success of the program was the provision of farm improvement grants of $50 per cultivated acre for drainage, lime and fertilizer which facilitated getting land into early production and the financing of other improvements out of income.

Farm vendors received no relocation grants, but many who had been forced to reduce operations due to age or ill health, looked on the program favorably as one facilitating retirement rather than forcing them out of agriculture. Satisfaction in seeing their land remain in farming, combined with retirement on or near their farms, minimized relocation problems and provided added support for the program.

While the program should have been of major interest and benefit to small farm operators, relatively few of these took advantage of it. As in many other farm programs, participants were mainly the early innovators, operators of better-than-average farms, and particularly those who had been actively pursuing a program of farm enlargement prior to the ARDA program and whose future plans included further expansion.

POLICY AND PROGRAM DEVELOPMENTS*

AGRICULTURAL STABILIZATION ACT

(Beef Stabilization Regulations No. 2, 1974)

The previous regulation had referred to payments ending on a date prior to March 18, 1975, as fixed by the Governor in Council. The Agricultural Stabilization Board decided to phase out the program, with the last payment being made on eligible animals slaughtered on or before August 25, 1974. (As announced, this was a temporary program, to be phased out as soon as the market appeared to have returned to normal.) The date for the last payment was stated in Section 1 (b) of paragraph 5 of the amendment. (PC 1974-1947, September 3)

(Cattle Stabilization Regulations, 1974-75)

The new regulations authorize the price stabilization for eligible beef cattle from August 12, 1974 to August 11, 1975.

In effect, the support level is $45.42, representing 154 percent of the 10-year base price. Payments will be made at the end of the period, as determined by the national average returns to producers during the preceding 12 months.

The mandatory support for cattle is 80 percent of the 10-year base price. For the cattle year starting April 1, 1974, the 80-percent mandatory level provided a support of $24.94 as against the $45.42 support level referred to above. (PC 1974-2109, September 24)

(Order respecting Manufacturing Milk and Cream Stabilization Order No. 2, 1974-75)

This order increases both the prescribed price and the payment to producers. The prescribed price is raised from 224.9 percent to 248.9 percent of the base price. The Agricultural Stabilization Board is authorized to pay the Canadian Dairy Commission $251.1 million between April 1, 1974 and March 31, 1975. The previous authorized payment was $232 million. According to the Minister's announcement on August 1, producer returns were to be increased by 91 cents per 100 pounds to bring their returns in line with current costs. Some 30 percent of the increase was to come through direct producer subsidies, and about 70 percent from higher prices for dairy products. (PC 1974-1948, September 3)

CANADA GRAIN ACT

(Rapeseed Regulations)

The Regulations under the Grain Act now require (in Section 25) that no operator of a primary elevator may receive rapeseed unless he receives from the producer a completed copy of Form 16. This form declares that the shipment being delivered contains rapeseed other than the varieties Oro, Zephyr, Span, Torch, Midas or Tower. Rapeseed of another variety must not be mixed with any of these varieties, in the elevator or on discharge.

The purpose is to segregate two types of rapeseed, one having a high content of erucic acid as required by some processors and the other having a low erucic content, which other purchasers require. The two types are segregated on the basis of information supplied by the producer to the elevator manager. Segregation must be maintained during storage at the elevator and during loading into rail cars.

AGRICULTURAL PRODUCTS MARKETING ACT

(Ontario Fresh Fruit Order)

This legislation updates the authority of the Ontario Fresh Fruit Growers' Marketing Board to regulate interprovincial and export trade of fruit produced in Ontario.

The Order allows the Board to make its own orders. It requires the Board to submit proposed regulations or orders to the federal Department of Agriculture for monitoring. (PC 1974-226, October 8)

FEEDS ACT

(Registration of Feeds)

The new schedule introduced by this legislation provides for a change from an annual registration requirements to a provision whereby feeds can be registered for a 1, 2 or 3-year period.

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*This is a summary of recent import federal agricultural legislation. For full details and exact wording consult the Canada Gazette, Part 2.

The registration fee per year is unchanged. This will allow one third of the registrations to be made each year, which should ease the burden of registration on industry and governments.

The schedule now provides for the addition of magnesium to mineral feeds. This can be effective in preventing hypomagnesemia in cattle.

The schedule provides for a change in Subsection 21(1) of Table 4. This relates to guarantee requirements for nutrients administered by injection. The change requires the guarantees to be expressed in terms that are dose-descriptive for the nutrients contained in the injections. (PC 1974-1628, July 23)

FARM CREDIT ACT

(Increase in interest on base rate)

From October 1, 1974 to March 31, 1975, the base rate of interest is $1^1/_4$ percent a year. This is an increase of 1 percent over the previous 6-month interest period. The Farm Credit Corporation is entitled to charge $9^1/_4$ percent, to cover costs of operation. (PC 1974-2164, September 26)

APPROPRIATION ACT NO. 4 (1973)

(New Terms and Conditions Concerning Fruit and Vegetable Storage Construction Financial Assistance)

This legislation sets out the terms and conditions under which the Government can pay subsidies for construction of storage facilities for fruits and vegetables. Existing wording in Sections 5, 6, 7 and 9 of the Terms and Conditions is made more precise. For example, in Section 2, the term "Project" now includes projects for modifications to existing facilities. Applicants are thus not restricted to construction of additional or totally new facilities.

Section 8 of the Terms and Conditions changes the requirement for a mandatory guarantee, such as a bond or mortgage, to provide for an option on the requirement of a security when it is obvious that there is a limited risk in contributing to the project. (PC 1974-1852, August 14)

GOVERNMENTAL PROGRAMS

In August the Government authorized two purchases of egg powder, for a total value of approximately $4,576,000, from the Canadian Egg Marketing Agency. The purchase was made to enable the Canadian International Development Agency (CIDA) to deliver the egg powder to the World Food Program. This was consistent with Canada's commitment to the W.F.P. (PC 1974-1846, August 8 and 1974-1900, August 14)

AGRICULTURAL PRODUCTS MARKETING ACT

(Increased Ontario Egg Marketing Levies)

The increased levy on egg producers became effective September 16. Its purpose was to enable the Ontario Egg Marketing Board to raise money to meet its indebtedness to the Canadian Egg Marketing Agency, and to prevent any buildup of local bank loans. The CEMA commitment was in accordance with an agreement reached by all provinces with CEMA that surplus eggs be delivered to CEMA, or failing that, a differential service charge would be made against the provinces for the equivalent value of the eggs calculated to be surplus.

Effective October 14, the levy is decreased to a total of 8 cents – 3 cents direct to CEMA and 5 cents to the Ontario Board for their commitments and management costs. (SOR/74,526, September 16)

PUBLICATIONS

Readers: in ordering publications, use the addresses as shown.

ECONOMICS BRANCH PUBLICATIONS

Available from the Economics Communications Unit, Agriculture Canada, Ottawa, K1A 0C5

National and Regional Hog Supply Functions, S.B. Chin, J.L. Pando and D.A. West, Pub. No. 74/15.

AGRICULTURE CANADA

Available from the Information Division, Agriculture Canada, Ottawa, K1A 0C5

Canadian Plant Disease Survey. Issued by the Research Branch. Quarterly, 27cm. Paper cover. Vol. 54, No. 1, March 1974, pp. 1-26. Cat. No. A-47-3/54-1. Free.

Winter Wheat Production in Western Canada. Ottawa, revised 1968, 1974. 16p. Figs., chart. 23cm. Paper cover. (Publication 1056). Cat. No. A53-1056. Free.

Planning Your Garden. R. Warren Oliver. Ottawa, revised 1969, reprinted 1974. 41p. Illus. 35cm. (Publication 1182). Prepared in the Research Branch. Cat. No. A53-1182. $1.25 per copy.

Growing Red Raspberries in Eastern Canada. D.L. Craig. Ottawa, 1964, reprinted 1972, revised 1974. 14p. Illus. 23cm. (Publication 1196). Prepared in the Research Station, Kentville, N.S. Cat. No. A53-1196. Free.

The Lighter. Quarterly, 23cm. Paper cover. Partly bilingual. Vol. 44, No. 3, Summer, 1974, 48p. Cat. No. A27-10/44-3. Free.

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Irrigating Schedules for Early Potatoes in Southwestern Ontario. J.M. Fulton. Ottawa, 1966. Reprinted, 1974. 14p. Illus., Tables. 23cm. Paper cover (Publication 1311). Prepared in the Research Station, Harrow, Ontario. Cat. No. A53-1311. Free.

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Fruit and Vegetable Preparations. Vol. 12, No. 2. Quarter ended June 30, 1974. Bilingual. Cat. No. CS32-017. 35¢ a copy, $1.40 a year.

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Selected Dairy By-Products. Production and inventory of process cheese, Vol. 3, No. 13, July 1974. Bilingual. (Service Bulletin). Cat. No. CS32-024. $1.40 a year.

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Dairy Factory Production. Vol. 43, No. 7, July 1974. Bilingual. Cat. No. CS32-002. $1.50 a year.

Farm Implement and Equipment Sales. Vol. 16, No. 7, January 1 to July 31, 1974. Bilingual. Cat. No. CS63-009. $1.50 a year.

Selected Dairy By-Products. Production and inventory of process cheese, Vol. 3, No. 16, August 1974. Bilingual. (Service Bulletin). Cat. No. CS32-024. $1.40 a year.

Stocks of Frozen Meat Products. Vol. 57, No. 9, September 1974. Bilingual. Cat. No. CS32-012. 30¢ a copy, $3 a year.

Stocks of Fruit and Vegetables. Vol. 38, No. 9, September 1974. Bilingual. Cat. No. CS32-010. 30¢ a copy, $3 a year.

Field Crop Reporting Series, 1974. No. 18. Telegraphic crop report. Canada. Released September 12, 1974. Cat. No. CS22-002. $5.60 for series of 20 reports.

Fruit and Vegetable Crop Report, 1974. No. 5. Second forecast of the commercial production of all fruits, 1974. Published September 1974. Bilingual. Cat. No. CS22. $1.40 for 1974 Series.

Wheat Review. Vol. 45, No. 2, September 1974. Bilingual. Cat. No. CS22-005. 40¢ a copy, $4 a year.

Fruit and Vegetable Preservation. Pack of processed strawberries 1974. Vol. 3, No. 12, September 1974. Bilingual (Service Bulletin). Cat. No. CS32-023. $1.40 a year.

Grain Trade of Canada. 1972/73. Ottawa, 1974. 97p. Tables. 28cm. Paper cover. Bilingual. Prepared in Crops Section, Agriculture Division. Cat. No. CS22-201/1973. $1.40 a copy.

Tobacco and Tobacco Products. Vol. 3, No. 11. October 1974. Bilingual. (Service Bulletin). Cat. No. CS32-022. $1.40 a year.

Fruit and Vegetable Preservation. Pack of processed cherries, 1974. Vol. 3, No. 14, October 1974. Bilingual. (Service Bulletin). Cat. No. CS32-023. $1.40 a year.

Shipments of Prepared Stocks and Poultry Feeds. Vol. 28, No. 7, July 1974. Bilingual. Cat. No. CS32-004. 40¢ a copy, $4 a year.

Oilseeds Review. Vol. 5, No. 1, September 1974. Bilingual. Cat. No. CS22-006. $1.05 a copy, $4.20 a year.

Coarse Grain Review. Vol. 33, No. 4. August 1974. Bilingual. Cat. No. CS22-001. $1.05 a copy, $4.20 a year.

Fluid Milk Sales. Vol. 28, No. 7, July 1974. Bilingual. Cat. No. CS23-002. $1.50 a year.

Fish and Fish Products. Advance release of fish landings. British Columbia. Vol. 3, No. 77. August 1974. Bilingual. (Service Bulletin). Cat. No. CS24-003. $1.40 a year.

Field Crop Reporting Series. No. 19. September forecast of production of principal field crops. Canada, 1974. Bilingual. Released October 4, 1974. Cat. No. CS22-002. $5.60 for series of 20 crop reports.

Farm Cash Receipts. Vol. 35, No. 7, July 1974. Bilingual. Cat. No. CS21-001. 30¢ a copy, $3 a year.

Dairy Factory Production. Vol. 43, No. 8, August 1974. Bilingual. Cat. No. 32-002. $1.50 a year.

Dairy Review. Vol. 35, No. 7, July 1974. Bilingual. Cat. No. CS23-001. 40¢ a copy, $4 a year.

PARLIAMENTARY PUBLICATIONS

Available from Information Canada, 171 Slater Street, Ottawa, K1A 0S9

Standing Committee on Agriculture. 2nd session, 29th parliament, 23 Elizabeth II, 1974. Chairman: Mr. Ross Whicher. Bilingual. Index of proceedings, issues Nos. 1-13. Organization meeting. Tuesday, March 5, 1974. Last meeting: Tuesday, April 30, 1974. 26p. Cat. No. XC12-292/1-14. 35¢ a copy.

West Coast Grain Handling Operations Act. 1974. (An Act to provide for the resumption of grain handling operations on the west coast of Canada). First reading, October 7, 1974. (The Minister of Labour). 5p. Cat. No. XB301-12/7. 15¢ a copy.

Canadian Wheat Board Act. R.S. 1970. c. C.-12 amended by R.S. c.15 (2nd Supp.) 1972, c. 16 (proclaimed in force August 1, 1972). Office consolidation. Ottawa, 1972, reprinted, 1974. 39p. 27cm. Paper cover. Bilingual. Cat. No. YX-75C-12-1972. $1 a copy.

Bills of the House of Commons. 1st session, 30th parliamentary. 24 Elizabeth II, 1974. Bilingual. Cat. No. XB301. $10 (subscription).

Canadian Wheat Board Act. S.6 - An Act to amend First reading, October 1st, 1974. (Honourable Senator Perrault, P.C.) 1p. Cat. No. YB301-6/1. 15¢ a copy.

Combines Investigation Act and the Bank Act. An Act to amend, and to repeal an Act to amend, an Act to amend the Combines Investigation Act and the Criminal Code. First reading, October 2, 1974. (The Minister of Consumer and Corporate Affairs). 48 p. Cat. No. XB31-2/1. 35¢ a copy.

An Act to Amend the Prairie Grain Advance Payments Act. First reading, October 4, 1974. (The Minister responsible for the Canadian Wheat Board). 2p. Cat. No. XB301-10/1. 15¢ a copy.

IN REPLY

The June article by D.M. Byers on "New Brunswick Agriculture" brought comments from E.N. Estabrooks, Credit Counsellor and Farm Management Consultant, N.B. Department of Agriculture, in Sussex, N.B. The article, he writes, "pulls together a lot of information that's available from different sources. It should be of interest to others outside the Atlantic area in finding out that N.B agriculture is not just 'small potatoes' but is developing in many commodities... Such articles featuring other provinces would be most useful...How about an overview on Quebec or Nova Scotia, etc.? "

Agreed... the suggestion has been considered and it is mainly a matter of priorities of work by economists. - Managing Editor.

From I.J.S. Bowie, lecturer at Mitchell College of Advanced Education, Bathurst, New South Wales, Australia, came this comment on the same article: "A most comprehensive and lucid descriptive analysis of N.B. agriculture... some valuable insights into marketing and present and future developments. But, while as a geographer I give special credit for the author's concern with patterns and locations (to the extent of including data tabulated at county level) we could use here a map of counties when county data is presented."

Harold Cox, marketing accountant of Mississauga, Ontario, found "Marketing Boards and Pricing in Canada" in the June issue a "very useful, well documented, concise report on the powers and procedures of each marketing board in Canada." Mr. Cox said "Protein Meal Markets", which was in the same issue, "made no reference to meat meal or poultry meal by-product. Re-cycling of animal and poultry waste is an important source of protein and can be used in prepared feeds for livestock and poultry." His comments have been given to the author.

Anne McLean-Bullen, a frequent commentator on our articles, wrote a list of thoughtful suggestions to G.A. Hiscocks and T.A. Bennett, authors of "Marketing Boards and Pricing in Canada" in the June issue. She said that the paper in general omitted "economic and social factors which are important and controversial, raising a whole vista of ethical considerations, e.g., the accountability of Marketing Boards to the public good..." The authors have received her comments for consideration.

Daniel Gagnon, Montreal economist, a member of the Economic Council of Alme, Quebec, sent these comments on a recent edition of C.F.E. (in its French version): "Personally, I consider that this periodical is a very good source of information concerning the agricultural economy. Congratulations."

Continuing the correspondence about R.D. Bollman's article on "Off-farm Work by Operators of Canadian Census Farms", the author replies to several questions: "Regional and provincial analysis is certainly one of the most important avenues to continue the investigation into the extent and nature of off-farm work. However, the 1972 Agriculture Enumerative Survey was not considered adequate for a detailed regional analysis of the results. (A provincial breakdown of total off-farm income has been published in the Quarterly Bulletin of Agricultural Statistics, Cat. No. 21-603, July-September, 1973, p. 159).

"Probably the best sources for additional information are: (1) Information from the Department of National Revenue being tabulated by Ms. J. Leblanc-Cooke of the Agricultural Division, Statistics Canada, and (2) the results to be published from the linkage of the agriculture and population questionnaire in the 1971 census program. Both sources can provide detailed tabulations for analysis at the provincial level, plus information on what proportion of total net income comes from off-farm sources."

IN REPLY TO AUTHORS AND EDITORS REGARDING OCTOBER 74
CANADIAN FARM ECONOMICS

I have read the following article(s):

(1) Direct Marketing of Fresh Fruit and Vegetables – A Look at Farmers' Markets in Canada
(2) Economics of Growing and Feeding Corn Silage in the Prairie Provinces
(3) Farm Business Financing and Taxation Relationships
(4) Farm Adjustments Associated with the ARDA Farm Enlargement and Consolidation Program in Nova Scotia

My comments are on article number

This article was: not useful 1 2 3 4 5 6 7 8 9 10 very useful.

Because (e.g., The most important economic and social factors were studied. The work was well documented and the conclusions were useful to me).

Beefs Bouquets (Suggestions to authors, publications committee and editors)

My comments may ( ) may not ( ) be used in a future issue of this publication if the editor wishes.

NAME (Please print) . . . . Occupation . . . .

ADDRESS . . . .

Please place this sheet in an envelope and address it to:

IN REPLY,
Att: John McConnell,
Economics Branch,
C.D.A., Sir John Carling Building,
OTTAWA, Ontario, K1A 0C5

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CANADA DEPARTMENT OF AGRICULTURE
OTTAWA, ONT.
K1A 0C5

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VOLUME 9 NUMBER 6 DECEMBER 1974

CANADIAN FARM ECONOMICS

HON. EUGENE WHELAN, MINISTER — S.B. WILLIAMS, DEPUTY MINISTER

Agriculture Canada

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Letters from readers: Letters are encouraged and should be addressed to the author or the Managing Editor. Responses . . . comments, suggestions and points of view are important for effective two-way communications. Letters may be used in the following issue of CFE and will be edited prior to publication where necessary.

A COMPARISON OF THE DAIRY INDUSTRIES IN CANADA AND THE UNITED STATES

V. McCormick *

The dairy industries in Canada and the United States are alike in many ways. Similarities exist in per capita consumption of milk, technological innovations, improvement in the marketing structure, and dairy policies.

INTRODUCTION

Canada and the United States produce a substantial quantity of the world's milk output. The United States is the second largest producer in the world after the U.S.S.R. and Canada ranks about tenth in world output of milk.

Milk production in 18 principal producing countries in Western Europe, North America and Oceania totalled 417 billion pounds in 1972. Canada produced 17.7 billion pounds, or 4.2 percent of the total output of the 18 countries and the United States produced 120.3 billion pounds, or 28.8 percent. Production in the United States is greater than the combined output of France (64.4 billion pounds in 1972), West Germany (47.4 billion) and Belgium (8.3 billion). Canada produces more milk than Australia (15.7 billion pounds in 1972), New Zealand (13.8 billion), Denmark (10.6 billion), Ireland (8.6 billion) and Japan (10.9 billion).

Geographically, the largest milk producing regions in Canada are in the southern part of Quebec, (particularly in the St. Lawrence River area and south to the United States border) and in Southern Ontario. Ontario and Quebec produced about 73 percent of the total Canadian milk output in 1973. Milk production in the United States is concentrated largely in the Lake States of Wisconsin, Minnesota and Michigan; the Northeast States (particularly New York and Pennsylvania); the Corn Belt States (Ohio and Iowa) and the Pacific States (California). Around 60 percent of total milk output in the United States occurs in these eight states. About 28 percent of milk output in the United States occurs in the three Lake States, with production in Wisconsin alone greater than the total output of Canada.

The dairy industries in Canada and the United States have many things in common. In both countries per capita consumption of milk is large and most is produced domestically. Technological innovations at the farm and factory levels have contributed greatly to the development of the industry in both countries in recent years. Improvement in the marketing structure has encouraged the acceleration in the switch from cream to whole milk deliveries. However, this switch started later in Canada than in the United States. Dairy policies in the two countries also have much in common such as price supports, "offer-to-purchase" programs and import controls.

MILK PRODUCTION

Canada's dairy herd of some 2.2 million cows produced 16.88 billion pounds of milk in 1973, an annual average output of about 7,850 pounds per cow (Table 1). The

*Veronica McCormick is an economist with the Marketing and Trade Division, Economics Branch, Agriculture Canada.

TABLE 1. TOTAL MILK PRODUCTION, MILK COWS ON FARMS, AND OUTPUT PER COW IN CANADA AND THE UNITED STATES, 1964-1973.

	Canada			United States		
Year	Total Milk Production	Milk Cows on Farms	Output per cow[1]	Total Milk Production	Milk Cows on Farms	Output per Cow[2]
	Million lb	thousand	lb	million lb	thousand	lb
1964	18,505	2,845	6,504	126,967	15,677	8,099
1965	18,357	2,795	6,568	124,180	14,953	8,305
1966	18,265	2,674	6,831	119,912	14,071	8,522
1967	18,039	2,569	7,022	118,732	13,415	8,851
1968	18,153	2,489	7,293	117,225	12,832	9,135
1969	18,472	2,442	7,564	116,108	12,307	9,434
1970	18,025	2,389	7,545	116,962	12,000	9,747
1971	17,469	2,255	7,747	118,532	11,842	10,009
1972	17,676	2,211	7,995	119,904	11,698	10,250
1973	16,886	2,152	7,847	115,620	11,419	10,125
1974	–	2,080	–	–	11,149	–

[1] Total annual milk production divided by numbers of female stock 2 years old and older kept mainly for milk purposes on farms at June 1.

[2] Total annual milk production divided by annual average numbers of milk cows, excluding heifers not yet fresh.

SOURCE: Statistics Canada "Dairy Statistics" Annual publications.
U.S.D.A. "Dairy Situation" monthly publications.

dairy herd in the United States in 1973 consisted of 11.4 million cows, which produced 115.6 billion pounds of milk, giving an average annual yield of 10,125 pounds per cow. Average yields per cow in both countries in 1973 were below year-earlier levels, which was attributed to farmers cutting down on high concentrate feeds as the result of sharply higher feed costs.

The methodology for arriving at yield per cow (by dividing total milk production by numbers of cows reported on farms) can be questioned. Canada, for example, has a large number of farms reporting one to seven milk cows, and these contribute a relatively small amount to the commercial milk supply. A similar situation exists in the United States, but in that country milk cow numbers exclude heifers that have not yet freshened, whereas in Canada a milk cow is defined as a female two years old or over, which may or may not have produced a calf. Canada has some of the highest milk producing herds in the world, but because of the inclusion of low-yielding, non-commercial cows in the total statistics, the average production per cow appears

TABLE 2. PERCENTAGE UTILIZATION OF MARKET SUPPLY OF MILK IN CANADA AND THE UNITED STATES. 1965-1973.

	Canada				United States			
Year	Fluid Use	Creamery Butter	Cheese[a]	Other Factory Products	Fluid Use	Creamery Butter	Cheese[a]	Other Factory Products
				– percent –				
1964	30.7	49.5	10.8	9.0	45.6	25.9	13.0	15.5
1965	31.3	47.2	12.0	9.5	46.8	24.1	13.3	15.8
1966	31.3	46.7	13.0	9.0	47.8	20.4	14.4	17.4
1967	31.4	46.5	12.7	9.4	47.0	22.7	15.0	15.3
1968	30.6	46.9	13.3	9.2	47.6	22.1	15.6	14.9
1969	29.7	47.8	13.5	9.0	47.1	21.1	15.7	16.1
1970	31.0	45.7	14.4	8.9	45.8	21.1	17.3	15.8
1971	32.4	41.2	17.0	9.4	45.0	20.8	18.1	16.1
1972	32.7	41.2	16.9	9.2	45.7	19.6	19.5	15.2
1973	35.1	37.5	17.7	9.7	46.8	16.8	20.4	16.0

[a] Whole milk cheese.

SOURCE: Statistics Canada, "Dairy Statistics" Annual publications.
U.S.D.A. "Dairy Situation" May, 1974

TABLE 3. TOTAL MILK PRODUCTION, LESS AMOUNT FED TO LIVESTOCK, AND DOMESTIC DISAPPEARANCE IN CANADA AND THE UNITED STATES, 1964-1973.

Year	Canada					United States				
	Production	Fed to Livestock	Available for H. Cons.	Domestic Disapp.	Balance	Production	Fed to Livestock	Available for H. Cons.	Domestic Disapp.[a]	Balance
	— million pounds —									
1964	18,505	823	17,682	17,452	230	126,967	2,152	124,815	119,582	5,233
1965	18,357	775	17,582	17,603	−21	124,180	2,061	122,119	118,692	3,427
1966	18,265	709	17,556	17,410	146	119,912	1,973	117,939	116,723	1,216
1967	18,039	700	17,339	17,322	17	118,732	1,900	116,832	113,450	3,382
1968	18,153	689	17,464	17,233	231	117,225	1,890	115,335	113,663	1,672
1969	18,472	689	17,783	17,109	674	116,108	1,700	114,408	113,232	1,176
1970	18,025	683	17,342	17,454	−112	116,962	1,700	115,262	113,173	2,089
1971	17,469	675	16,794	17,680	−886	118,532	1,600	116,932	113,876	3,056
1972	17,676	663	17,013	17,670	−657	119,904	1,600	118,304	115,540	2,764
1973	16,886	703	16,183	17,499	−1,316	115,620	1,600	114,020	115,650	−1,630

[a]Civilian Disappearance (excluding military) but including U.S.D.A. donations, National School Lunch and Special Milk Programs.

SOURCE: Statistics Canada "Dairy Statistics", annual publications.
U.S.D.A. "Dairy Situation", monthly publications.

to be relatively low. However, the series gives an indication of production trends in both countries.

MILK UTILIZATION

About 35 percent of the total Canadian market supply of milk and cream, on a milk fat equivalent basis, goes into fresh fluid milk and cream sales (Table 2). About 37.5 percent is utilized in the production of creamery butter, 18 percent in the production of cheddar and other whole milk cheeses and nearly 10 percent goes into other products, such as evaporated whole milk and ice cream.

In the United States a higher percentage of the total marketings is used for fresh fluid sales and a much smaller percentage is directed to the manufacture of butter. Milk utilization in the United States in 1973 was as follows: fluid use, 46.8 percent; creamery butter, 16.8 percent; cheese, 20.4 percent and other factory products, 16.0 percent.

DOMESTIC DISAPPEARANCE

Canada has changed from a net exporter of dairy products, on a whole milk basis, to a net importer. Since 1970, domestic disappearance of milk and dairy products on a milk fat basis has been greater than the milk available for human consumption; e.g., total production less that amount fed to livestock (Table 3). The deficit in 1973 was 1.3 billion pounds in whole milk equivalent, which was offset by stocks of dairy products at the beginning of the year and imports of 62 million pounds of butter and 43 million pounds of cheese. Despite the deficit in whole milk equivalent, historically Canada has had a surplus of the solids-not-fat portion of milk in the form of skim milk powder. The exportable surplus of skim milk powder from the 1973 skim powder production amounted to around 200 million pounds.

The United States, which has been traditionally a net exporter of dairy products, became a net importer in 1973 (Tables 4, 5). Civilian domestic disappearance of milk and dairy products in the United States in 1973 was 1.6 billion greater than the amount available from production for human consumption (Table 3). This necessitated imports in 1973 amounting to 3.9 billion pounds in whole milk equivalent, which was mostly in the form of cheese (232 million pounds); butter (56 million pounds); and butter oil (24 million pounds). Additional solids-not-fat requirements were met through the importation of 267 million pounds of skim milk powder. United States exports of dairy products in 1973 were equivalent to 0.7 billion pounds of whole milk and were mostly in the form of whole milk powder and evaporated whole milk.

PER CAPITA CONSUMPTION

Canadians drink more milk and consume more butter and evaporated whole milk per person than the Americans, but cheese consumption is less (Table 6). There is little difference in per capita skim milk powder consumption in the two countries. An outstanding difference is in the consumption of butter. In 1973, Canadians consumed 13.7 pounds of butter per capita compared to the United States consumption of 4.8 pounds. Canadians consume slightly more cheddar cheese per capita than Americans but lag behind in the

TABLE 4. DAIRY PRODUCT IMPORTS, CANADA AND THE UNITED STATES, 1964-1973.

	Canada				United States			
Year	Butter	Cheese	Dry Products[b]	Evaporated and Condensed Whole Milk	Butter[c]	Cheese	Dry Skim Milk	Evaporated and Condensed Whole Milk
				— million pounds —				
1964	—	15.3	2.0	5.9	2.2	78.0	1.6	1.0
1965	—	17.7	7.6	4.1	2.2	79.3	1.4	1.8
1966	—	18.3	2.7	12.0	2.2	135.4	2.8	3.3
1967	2.3[a]	23.7	7.2	9.8	2.2	151.8	0.9	5.4
1968	3.4[a]	27.0	8.1	8.6	2.2	170.4	1.7	9.8
1969	—	31.3	7.6	5.8	2.2	144.1	1.9	5.4
1970	—	30.6	7.7	7.7	2.2	161.3	1.8	2.7
1971	7.9	34.6	3.6	12.2	2.1	136.0	2.1	3.0
1972	4.5	37.5	4.0	17.1	2.2	179.4	1.6	2.4
1973	62.3	43.2	4.3	6.2	84.8	232.0	266.6	2.8

[a]Excludes imported butter for processing into "materials for food preparation" which were subsequently exported.
[b]Milk, cream and by-products, powdered.
[c]Includes butter equivalent of butteroil and anhydrous milk fat.

SOURCE: Statistics Canada, "Dairy Statistics" Annual publications; U.S.D.A. "Dairy Situation" monthly publications.

consumption of other cheese varieties made from whole milk. Per capita ice cream consumption is greater in Canada.

DAIRY SUPPORT PROGRAMS

After World War II, governments in Canada and the United States were obligated to assist primary producers to adjust to post-war conditions. Assistance was given in the form of price stabilization for key agricultural products.

The Federal government supports the Canadian dairy industry through "offer-to-purchase" programs for certain dairy products - mostly butter, cheddar cheese

TABLE 5. DAIRY PRODUCT EXPORTS, CANADA AND THE UNITED STATES, 1964-1973.

	Canada					United States					
Year	Butter	Cheese[c]	Dry Skim Milk	Dry Whole Milk	Evaporated Whole Milk	Butter[de]	Cheese[cd]	Dry Skim Milk[d]	Dry Whole Milk	Evaporated Whole Milk[d]	Condensed Whole Milk
						— million pounds —					
1964	113.7[ab]	31.7	42.1	18.5	18.1	296.5	9.1	1,310.9	12.3	37.7	62.8
1965	5.4[ab]	32.1	86.3	19.7	6.7	65.7	6.8	863.4	18.6	24.7	65.8
1966	0.7[a]	35.9	69.4	6.7	8.5	13.7	6.0	387.7	15.6	38.4	94.3
1967	—	27.7	95.0	4.9	7.3	2.9	6.4	409.0	11.9	33.8	29.2
1968	—	43.8	127.1	0.8	7.2	32.2	6.8	397.1	17.2	32.7	42.5
1969	—	36.0	238.3	0.6	6.8	20.8	7.2	329.4	13.9	37.1	52.2
1970	—	39.4	297.2	—	11.9	1.9	6.7	416.1	12.6	33.3	16.4
1971	4.5	32.8	240.4	—	3.6	92.8	6.5	357.6	23.6	32.7	35.2
1972	—	21.0	114.5	—	2.4	43.6	6.4	273.3	37.6	40.5	14.9
1973	—	11.9	267.6	1.0	0.3	3.8	7.0	17.7	49.4	41.4	2.0

[a]Includes butter equivalent of butteroil.
[b]Data for 1965 includes adjustment for 2.8 million pounds of butter exported in 1964 but due to lagged reporting is credited to 1965 official trade statistics.
[c]Cheddar and other cheese.
[d]Includes commercial exports, relief and charity shipments.
[e]Includes deliveries of butter and butter equivalent of anhydrous milk fat and butteroil.

Note: Canadian exports of condensed milk not significant.

SOURCE: Statistics Canada "Dairy Statistics" annual publications U.S.D.A. "Dairy Statistics 1960-67" "Dairy Situation" monthly publications; Foreign Agriculture Circular FD3-74.

TABLE 6. PER CAPITA CONSUMPTION OF SELECTED DAIRY PRODUCTS IN CANADA AND THE UNITED STATES, 1964-1973.

Year	Canada						United States[c]					
	Fluid Products[a]	Total Butter	Cheese Cheddar	Cheese Other[b]	Evaporated & Condensed Milk	Dry Skim	Fluid Products[a]	Total Butter	Cheese Cheddar[d]	Cheese Other	Evaporated & Condensed Milk	Dry Skim
	— Pounds —											
1964	321	19.0	5.9	1.7	16.6	7.9	304	6.9	6.2	3.2	11.4	5.9
1965	317	18.5	6.1	1.9	16.2	7.1	302	6.4	6.2	3.4	10.7	5.6
1966	312	17.8	5.9	2.0	16.1	8.2	297	5.7	6.2	3.6	9.7	5.9
1967	303	16.9	6.2	2.3	15.4	6.8	285	5.5	6.4	3.7	9.0	5.6
1968	295	16.5	6.2	2.7	15.0	7.8	280	5.7	6.6	4.0	8.9	5.8
1969	287	15.7	6.7	3.1	13.7	10.1	272	5.4	6.7	4.2	7.9	5.8
1970	274	15.7	7.3	3.3	12.9	6.2	264	5.3	7.1	4.4	7.1	5.4
1971	272	15.7	7.4	3.8	12.6	5.0	259	5.1	7.4	4.7	6.8	5.3
1972	274	14.9	7.6	3.8	12.0	4.7	263	4.9	7.8	5.4	6.4	4.6
1973 (preliminary)	275	13.7	8.4	4.0	11.4	5.2	259	4.8	7.9	5.6	6.0	5.5

[a] Includes fluid sales of milk and cream, in milk equivalent, sold off farms for fluid purposes, plus milk and cream consumed in farm homes.

[b] All varieties made from whole milk and cream, except cheddar.

[c] Civilian consumption, excludes military.

[d] American cheese.

SOURCE: Statistics Canada "Dairy Statistics", annual publications.
U.S.D.A. "Dairy Situation", May, 1974.

TABLE 7. SUPPORT PRICES FOR CREAMERY BUTTER, CHEDDAR CHEESE AND DRY SKIM MILK IN CANADA AND THE UNITED STATES, 1965-1973.

Dairy Year Beginning April 1	Canada			United States		
	Creamery Butter	Cheddar Cheese	Dry Skim Milk (Spray)	Creamery Butter	Cheddar Cheese	Dry Skim Milk (Spray)
	Canadian cents per pound			U.S. cents per pound[h]		
1965-66	64.0[a]	35.0	None	59.75	36.10	14.60
1966-67	59.0	38.0	f	61.75-67.25[i]	39.30-43.75[i]	16.60-19.60[j]
1967-68	63.0	38.0	20.0	67.25	43.75	19.60[k]
1968-69	63.0-65.0[b]	42.0-47.0[e]	20.0	67.25	47.00	23.10
1969-70	65.0	42.0-47.0[e]	20.0	68.50	48.00	23.35[l]
1970-71	65.0	42.0-47.0[e]	20.0	70.75	52.00	27.20
1971-72	65.0-68.0[c]	51.0-54.0[c]	24.0-26.0[c]	68.75	54.75	31.70
1972-73	68.0	54.0	29.0	68.75	54.75	31.70
1973-74	71.0	60.0	35.0-38.0[g]	62.0	62.00-65.00[j]	37.50-41.40[j]
1974-75	77.0-85.0[d]	60.0	50.0-54.0[d]	62.0	70.75	56.60

[a] Producer support consisted of a butter "offer-to-purchase" price of 55 cents plus a 9-cents subsidy.
[b] Price change effective September 30, 1968.
[c] Price change effective August 16, 1971.
[d] Price change effective August 1, 1974.
[e] Price range according to season of production.
[f] No support price as such; periodic purchases were made by the Agricultural Products Board. The Board was authorized to purchase dry skim at a price not exceeding 18 cents.
[g] Price change effective August 1, 1973.
[h] At New York.
[i] Price change effective, June 30, 1966.
[j] Price change effective, August 10, 1973.
[k] Prices in 50-pound bags 0.25 cent higher, beginning October, 1967.
[l] Price for 50-pound bags — Starting April 1, 1970, bulk powder purchased only in 50-pound bags.

SOURCE: Agriculture Canada announcements
Dairy Situation, July 1974, U.S.D.A.

and skim milk powder - and by direct subsidy payments to producers of industrial milk and cream. From time to time, the Federal government has given assistance in moving surplus dairy products to export markets.

In Canada, butter and cheddar cheese are mandatory commodities under the Agricultural Stabilization Act of 1958 and must be supported at not less than 80 percent of the base price (the average price at representative markets for the preceding 10 years). Dry skim milk has generally been supported in the last 10 years as a non-mandatory commodity (Table 7). Dairy products are usually supported at prices much above the mandatory 80 percent of the base price. The current support price of 85 cents a pound for butter is about 36 percent above the base price.

In addition to market support, a direct subsidy payment is made by the Canadian government for quota deliveries of industrial milk and cream. The current subsidy payment (effective August 1, 1974) is $2.56 for each 100 pounds of 3.5 percent milk and 73.14 cents for each pound of butterfat in cream. A levy of 15 cents for each 100 pounds of milk is deducted to offset costs incurred in exporting dairy products, mostly skim milk powder. Over-quota shipments are penalized by a deduction from the market price of $1.50 for each 100 pounds of milk and 22 cents for each pound of butterfat in cream. Initially, individual market - sharing quotas were based on production performance of individual producers during a previous representative period. Market-sharing quotas are now negotiable. However, because of the current shortfall in milk production, producers in most regions can receive additional free market-sharing quotas in 1974 by applying to their provincial agencies.

In the United States, price support has been carried out mainly by purchases of butter, cheddar cheese and skim milk powder. These operations, however, have been supplemented by several related programs such as the National School Lunch Program, a Special School Milk Program, special assistance for fluid milk purchased by Armed Forces and Veterans hospitals, welfare programs, and assistance to exporters of certain dairy products. The Federal Milk Order Program requires fluid milk processors in a large number of fluid milk markets to pay farmers not less than specified prices for milk. In Canada, minimum fluid milk prices to farmers are set by provincial marketing boards or similar agencies.

It is somewhat difficult to compare support prices in the two countries because of such factors as the different kinds of support and the variations in rates of currency exchange. The support price for creamery butter in the United States, for example, is 62 cents (about 61 cents Canadian currency) a pound compared to the current Canadian support price of 85 cents (Table 5). The support prices for cheddar cheese and dry skim milk are higher in the United States than in Canada, although Canadian cheddar has been selling on the exchanges at prices sharply above the support levels since mid-1971.

TABLE 8. SUPPORT PRICES FOR INDUSTRIAL MILK IN CANADA AND THE UNITED STATES, 1965-74.

Dairy Year Beginning April 1	Canada[a] Canadian dollars per 100 pounds (3.5% butterfat)	United States U.S. dollars per 100 pounds (national average butterfat)
1965-66	3.52[b]	3.24
1966-67	4.10[b]	3.50-4.00[f]
1967-68	4.75	4.00
1968-69	4.85	4.28
1969-70	4.85	4.28
1970-71	4.85	4.66
1971-72	5.14-5.39[c]	4.93
1972-73	5.65	4.93
1973-74	6.45-7.17[d]	5.29-5.61[d]
1974-75	8.50-9.41[e]	6.57

[a]Effective market support, plus subsidies, (excluding holdbacks for export assistance).
[b]Derived value — Average returns to producers plus subsidies.
[c]Price change effective August 16, 1971.
[d]Price change effective August 10, 1973.
[e]Price change effective June 1, 1974.
[f]Price change effective June 30, 1966.

SOURCE: Canadian Dairy Price Support Announcements; U.S.D.A. "Dairy Situation" monthly publications.

The greatest difference between Canadian and United States price supports is the direct subsidy paid to Canadian producers of industrial milk (Table 8). However, industrial milk prices in the United States tend to fluctuate seasonally according to supply and demand and in recent years have averaged well above the support levels. For example, the average price received by U.S. producers in March, 1974 for manufacturing grade milk was $8.11 per 100 pounds, an increase of $2.50 above the support price of $5.61 for industrial milk of average fat content (approximately 3.66 percent). By June 1974, the price had fallen to $6.50 per 100 pounds. Canadian prices in comparison tend to stay very close to the market support level.

The United States Agricultural Act of 1949 requires that prices to farmers for milk and butterfat be supported between 75 and 90 percent of their parity prices, at the beginning of the marketing year (April 1), as determined by the Secretary of Agriculture to assure an adequate

supply. The 1973 farm law requires that manufacturing (industrial) milk be supported between 80 and 90 percent of parity through March 31, 1975. Supports will then revert to the 75 to 90 percent requirement provided under the 1949 law. The 1973 law eliminated the support requirement for butterfat in farm-separated cream. The general level of parity prices for industrial milk corresponds to the U.S. average market price paid by plants to producers in relation to changes in a historical parity price index (index of prices paid by farmers).

TARIFFS AND TRADE BARRIERS

There has been relatively little trade between Canada and the United States in dairy products since World War II. Skim milk powder imports into the United States from Canada in 1972 and 1973 were an exception. Canada also imported about 16 million pounds of butter from the United States in the 1971-73 period. Controls on the importation of dairy products are in effect in both countries.

In order to support Canadian dairy stabilization programs, imports of any dairy product may be placed on the Import Control List of the Export and Import Permits Act. Currently, import permits are issued freely for natural cheese for direct consumption, other than cheddar and colby; traditional imports of processed cheese and casein are for industrial use. Imports of other dairy products, such as butter and evaporated milk, are allowed only in times of shortages.

Dairy products entering Canada are subject to tariffs. For example, the tariff on butter entering Canada from the United States is 12 cents a pound; and on cheeses, other than colby and cheddar, 3.5 cents a pound.

The United States has authorized import quotas on certain dairy products since 1953 in order to prevent interference with their price support program for milk and butterfat. For example, U.S. cheese imports from Canada are currently limited by annual quotas of 1,225,000 pounds for aged unpasteurized cheddar and about 612,350 pounds for other cheddar. Canada has a quota of about 2.7 million pounds of certain other cheese, which excludes Swiss and Gruyere, to the United States, but this quota is subject to a "pricebreak" of 78 cents a pound (effective April 1, 1974). The pricebreak is the Commodity Credit Corporation's purchase price per pound for U.S. cheddar plus 7 cents. Other Canadian specialty-type cheeses can be exported to the United States above the pricebreak without a quota if a market for this high price range can be maintained. Currently, Canada's specialty cheese prices are relatively high, which limits the volume of exports to the United States.

Because of a shortfall in milk output in the United States, which resulted in a tight supply situation for dairy products, temporary increased quotas were allowed in 1973 and early 1974. Dry skim milk powder imports were at record levels in 1973, when 265 million pounds were allowed to enter in four separate quota actions, with Canada supplying about 80 million pounds. The regular annual import quota for skim powder is only 1.8 million pounds. An additional temporary quota of 150 million pounds of skim milk powder was authorized in the first half of 1974, of which Canada supplied 21 million pounds.

The United States, which was the world's largest exporter of skim milk powder in the late 1950's and early 1960's (commercial exports and foreign donations were more than 1.1 billion pounds in 1963 and more than 1.3 billion in 1964) became a net importer in 1973 for the first year since the mid-1930's. The United States also had to discontinue its dairy food aid programs to developing countries in 1973.

Skim milk powder was not the only product for which U.S. quotas were opened. Early in January, 1974, a presidential proclamation authorized imports of 100 million pounds of cheddar cheese, allocated among supplying countries, to enter by March 31. Canada supplied 2.7 million pounds, under a 33-million pounds quota allocated to countries other than New Zealand and Australia. Butter imports were also allowed in under a special quota in late 1973.

Dairy product imports in milk equivalent into the United States in 1973 represented 3.4 percent of milk production, compared to 1.4 percent in 1972 and 0.7 percent in 1964. Expressed in terms of manufactured dairy products, the milk equivalent of U.S. dairy product imports represented approximately 6.3 percent of the consumption of all dairy products (excluding fluid products) in 1973, compared to 2.8 percent in 1972 and 1.3 percent in 1964.

Canadian imports of dairy products in milk equivalent amounted to 11.4 percent of milk production in 1973, 2.9 percent in 1972 and 0.9 percent in 1964. Dairy product imports as a percentage of Canadian consumption of manufactured dairy products in milk equivalent was 16.7 percent in 1973, 4.4 percent in 1972 and 1.5 percent in 1964.

The United States has a schedule of import duties, somewhat similar to Canada, on dairy product imports. The U.S. duties, unlike those of Canada, are generally tied to an annual quota. The absolute quota for butter under Section 22 of the Agricultural Adjustment Act is

707,000 pounds for butter and 1.2 million pounds for butter oil.

POSSIBLE TRENDS IN THE FUTURE

It is very difficult to predict what is likely to happen in the dairy industries in Canada and the United States in the next decade. Milk production in both countries has been trending downward in recent years. The 1973 shortfall - down 4.5 percent from year-earlier levels in Canada and down 3.5 percent in the United States - was attributed largely to sharp increases in input costs, particularly feed. The 1973 production was the smallest annual output in Canada since 1954 and in the United States since 1952. However, milk production has been improving in both countries and output for all of 1974 is expected to be close to 1973 levels in Canada and down about 1 percent from 1973 in the United States.

The structure of dairy farming has changed drastically in recent years and there will be a continuation of the trend towards much larger and more highly capitalized dairy farms. The number of farms in Canada reporting dairy cows in the 1971 Census declined 36 percent from 1966. In the United States, the decline from the 1964 Census to 1969 was 38 percent.

In 1971, Canadian dairy herds with 1 to 17 cows made up 54 percent of the farms, compared with 70 percent in 1966. Herds in the United States in 1969 with 3 to 19 cows represented 55 percent of the national herd, but in 1964 the figure was 65 percent. Thus, small dairy farmers have been leaving the industry at a more rapid rate in recent years in Canada than in the United States. The key factors in determining to what extent dairy farmers will expand their herds in the next decade will be input costs in relation to milk prices, availability of reliable farm labor and alternative on-farm and off-farm opportunities. For those wishing to enter the dairy industry, capital requirements and interest rates will be a determining factor.

Domestic disappearance of milk and dairy products in Canada on a milk equivalent basis has changed very little in the last decade (Table 3). Consumption of cheese and ice cream has been trending upward on a per capita basis, but this increase has been largely offset by per capita declines in butter and evaporated whole milk. Total consumption of fresh fluid milk and cream in milk equivalent in 1973 was down about 2 percent from 1964.

In the United States, civilian domestic disappearance of milk and dairy products, in milk equivalent, trended downward from 1964 to 1970, and then started to rise. Dairy product consumption followed much the same trend as in Canada.

In the next decade total domestic consumption of milk and dairy products in milk equivalent will likely trend upward in both Canada and the United States to keep pace with population growth. Much will depend on whether butter consumption continues to drop or levels off.

The United States, the second largest dairy producing country in the world, became a net importer of dairy products in 1973. It is likely that milk production in the United States will increase to take care of domestic requirements, with the exception of certain specialty-type cheese imports. If the trend of declining butter consumption in the United States continues, output of butter and skim milk powder will likely continue to drop. Assuming that skim powder production and domestic demand remains near current levels, the United States will be a regular net importer of skim milk powder.

Recent high prices for fluid milk and cream in the United States have reduced per capita consumption with the result that greater amounts of milk are available for production of cheese, butter and skim milk powder. To the extent that this price resistance continues or is reflected in a similar fashion in Canada, modifications in traditional patterns of milk supply utilization may be expected.

A COMPUTER MODEL FOR RATION FORMULATION AND SELECTION OF A FEEDING PROGRAM FOR CATTLE

Recent experiments concerning a feeding program for cattle provide a basis for a partial solution to the problem of maximizing net returns from the feeding activity. A linear programming model was developed to determine which feeding program produces the the highest net return under alternative feed and beef price levels and price differentials among grades.

*B.H. Sonntag and R. Hironaka**

INTRODUCTION

The way feeder cattle should be fed to maximize net returns from the feeding activity depends on a number of factors:

1. The absolute and relative prices of alternative feeds;
2. The price received for finished animals and the price differentials among grades;
3. Interest rates on capital to finance feeders and feed;
4. The length of feeding period required to finish animals on alternative diets and feeding levels;
5. The quality of carcass produced under alternative feeding programs;
6. The quantities of feed or specific nutrients required to finish animals under alternative feeding programs;
7. The performance of feeders on alternative diets that meet specified nutrient standards but differ in ingredient composition; and
8. The growth characteristics of the particular breed or type of cattle being fed.

Recent feeding experiments at the Canada Agriculture Research Station, Lethbridge provide a basis for at least a partial solution to the problem. In these experiments, a diet of known nutrient composition was fed at varying rates to 11 groups of Hereford steer calves to achieve selected rates of gain. Rates of gain, feed consumption, length of feeding period, dressing percentages, carcass quality, and other performance measures were recorded. A linear programming model was developed to determine which of the feeding programs produced the highest net return under alternative feed and beef price levels and price differentials among grades. A ration formulation sub-model was included to develop diets that meet the nutritional requirements of the optimal feeding program at least cost.

THE FEEDING EXPERIMENTS

Data from two feeding experiments that were designed to test the performance of steer calves under alternative feeding programs are summarized in Table 1. The calves weighed between 450 and 475 pounds at the beginning of the feeding period and were marketed when they reached a pre-selected weight range of 1,050 to 1,075 pounds. The first experiment included a full-fed treatment and five treatments in which feed inputs were

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TABLE 1. SUMMARY OF FEEDING EXPERIMENTS

Feeding Program	Days on Feed	Energy Intake Low	Medium	High	Total	Grade Distribution A1,2	A3	A4
		Mcal DE				percent		
First Experiment[1]								
HHH	230	–	–	5755	5755	6.7	26.7	66.7
LHH	258	864	–	4907	5771	–	64.3	35.7
LLH	298	1835	–	4015	5850	13.3	40.0	46.7
MHH	245	–	1274	4511	5785	7.1	57.1	35.7
MMH	256	–	2891	2618	5509	33.3	33.3	33.3
LMH	270	875	1473	3146	5494	40.0	33.3	26.7
Second Experiment[2]								
LMH	284	921	1446	3325	5692	68.7	18.8	12.5
HML	290	2547	1600	1646	5793	64.3	35.7	–
MMM	296	–	5635	–	5635	80.0	20.0	–
HHH	240	–	–	5883	5883	25.0	31.2	43.8
LLH	300	1988	–	3782	5770	60.0	26.7	13.3

[1] Feed restricted to obtain 1.0 (L) or 2.0 (M) pounds of gain a day. 'H' refers to full or ad debitum feeding. The three letters indicate the feeding levels at three stages in the program, eg., LMH refers to low, medium and high rates of gain in stages 1, 2, and 3, respectively.

[2] Feed restricted to obtain 1.0, 1.25 or 1.5 (L) or 1.5, 1.75 or 2.0 (M) pounds of gain a day in periods 1, 2, or 3, respectively. 'H' refers to full feeding.

restricted to limit gains to 1.0 or 2.0 pounds a day for the first 12 or 24 weeks[1]. All animals were full-fed for the remainder of the feeding period.

The second experiment included a full-fed treatment (HHH) and various other combinations of feed input restrictions designed to achieve selected rates of gain. The low rate of gain (L) in this experiment refers to 1.0, 1.25 or 1.5 pounds a day depending on whether the restriction occurred in the first 12 weeks, second 12 weeks, or final period. The medium rate of gain (M) indicates 1.5, 1.75 or 2.0 pounds a day if that restriction occurred in the first, second, or third period, respectively.

The main differences among feeding programs in the two experiments are found in grade distribution and length of feeding period. In comparison with the full-fed treatments, the grade distribution changed markedly in favor of the A1 and A2 grades in those treatments in which rate of gain was restricted at some stage in the feeding period. In those treatments in which rates of gain were severely restricted, were of short duration, or both (LHH, MHH), the effect was not very pronounced. However, when these restrictions extended over a greater proportion of the feeding period (MHH, LMH, HML, MMM and LLH) grades improved substantially. The length of feeding period ranged from 235 days for the full-fed treatment in the first experiment to about 300 days in treatments where rates of gain were restricted over extended periods (MMM and LLH). Total digestible energy (DE) intake was quite similar among treatments. Dressing percentage tended to be highest in the treatments with relatively high proportions of A3 and A4 carcasses, probably reflecting the higher fat content of these carcasses.

A comparison of the two experiments suggests that feed conversion was slightly better in the first experiment than in the second. Energy intake for each pound of gain was slightly higher while total weight gain and dressing percentage were slightly lower in the second experiment. These differences may be related to the differences in grade distribution between experiments and the apparent correlation between dressing percentage and grade.

THE LINEAR PROGRAMMING MODEL

A linear programming model was developed to show which of the feeding programs used in the experiments described above produces the largest return over feed costs. A ration formulation sub-model was included to formulate diets that meet the nutritional requirements of the optimum feeding program at least-cost. This sub-model assumes that animal performance will be

[1] R. Hironaka, G. C. Kozub, Compensatory Growth of Beef Cattle Restricted at Two Energy Levels for Two Periods, Canadian Journal of Animal Science, 53: 709-715.

identical on diets that are the same in terms of nutrient composition but different in ingredient composition[2]. Some of the model specifications are intended to ensure that this assumption is reasonable. These specifications differ for the low, medium, and high gain phases of the various feeding programs. The model develops least-cost diets for each phase of the optimal program.

Feed requirements, feeding period, animal weights, and grade distribution for the alternative feeding programs in the model are based on the feeding experiments (Table 1). Similar treatments from the two experiments (HHH, LMH, and LLH) were combined in the model. Nutrient content for the ingredients included in the ration formulation sub-model are based mainly on earlier work[3]. The model chooses the combination of ingredients that satisfies the diet specifications at least-cost.

The specifications for the ration formulation sub-model include:

1. Minimum and maximum levels for DE concentration[4];

2. Minimum levels for some ingredients and nutrients (oats, vitamin A, calcium, phosphorus, crude protein[5] (CP)); and

3. Maximum levels for some ingredients and nutrients (urea, beet pulp, molasses, rapeseed meal, and animal protein).

The following assumptions on prices and financing charges were made:

1. For feed prices, three feed price levels were used. These are representative of prices paid at southern Alberta feed mills in mid-1972; spring, 1973; and mid-1974 (Table 2).

TABLE 2. PRICE SERIES USED FOR STEERS AND FEED INGREDIENTS

	Price Series[2]		
	1	2	3
Item[1]	Mid '72	Spring '73	Mid '74
		$ a cwt	
Ingredients			
Barley	1.76	3.35	5.33
Wheat	2.03	3.85	6.47
Oats	1.58	3.71	5.38
Beet Pulp	2.60	3.30	3.20
Soybean Meal	8.00	27.00	7.75
Rapeseed Meal	4.60	14.85	5.60
		$ a ton	
Alfalfa Hay	33.00	50.00	60.00
Cereal Hay	32.00	30.00	47.00
Straw	17.00	20.00	26.00
		$ a cwt	
Steers			
Stocker Steers	45.00	50.00	50.00
A1, 2 Carcasses	55.00	69.25	86.00
A3 Carcasses	51.50	67.50	82.50
A4 Carcasses	48.00	65.00	79.00

[1] Only a partial list of ingredients in the model appears in the table.

[2] Feed prices are bulk prices at Lethbridge area feed mills, steer prices are based on Calgary market.

2. Concerning feed delivery and processing, the price would be $4.50 a ton for feed price levels 1 and 2 and $6.10 a ton for feed price level 3.

3. Interest charges would be 8 percent on $300 prorated on the basis of length of feeding period for feed price level 1, $400 for feed price level 2, and $500 for feed price level 3.

4. Regarding prices for steers, buying and selling prices are representative of the same three periods as those used for feeds (Table 2).

5. For feedlot operations, two specific assumptions were used: (1) All feedlot operating costs, marketing charges, insurance, health services, and the like are independent of the feeding program and hence have no effect on the selection of an optimal program. This assumption implies: (a) a relatively constant labor force that does not fluctuate markedly with number of feeders, e.g., labor cost is independent of length of feeding period; and (b) the portion of the feedlot devoted to calves is filled once a year and remains idle until it is re-filled the following fall, e.g.,

[2] This assumption will be tested in future feeding trials using diets formulated for several sets of ingredient prices.

[3] R. Hironaka, Feedlot Finishing of Cattle and Lambs in Western Canada, Agriculture Canada Publication 1236, 1965.

[4] Energy concentration was limited to a maximum of 1500 kilocalories of DE per pound of feed for all diets. Minimum DE concentration limits of 1150, 1225, and 1300 kilocalories per pound of feed were placed on diets for low, medium, and high rates of gain, respectively.

[5] Crude protein requirements are based on R. L. Preston, Protein Requirements of Growing-Finishing Cattle and Lambs, Journal of Nutrition, Vol. 90, No. 2, October 1966, pp. 157-160. Protein requirements are expressed in the model in terms of protein to energy (CP/DE) ratios. For restricted and full-fed diets the ratios were 0.0771 and 0.0837 pounds of CP per kilocalorie DE, respectively.

TABLE 3. COMPOSITION AND COST OF DIETS FOR LOW, MEDIUM, AND HIGH RATES OF GAIN FOR THREE FEED PRICE LEVELS

Item	Feed Price 1		Feed Price 2			Feed Price 3		
	Low & Medium	High	Low	Medium	High	Low	Medium	High
	percent							
Ingredients								
Barley	80.8	86.6	13.8	29.4	43.5	–	4.7	14.4
Oats	17.4	9.6	1.5	3.3	4.8	2.0	4.0	5.4
Beet Pulp	–	–	–	–	–	18.5	30.0	30.0
Rape Meal	–	–	–	–	–	–	1.2	4.5
Cereal Hay	–	–	83.1	65.8	50.7	76.6	58.1	45.0
Straw	–	2.6	–	–	–	0.9	–	–
Urea	–	0.1	–	–	–	–	–	–
Minerals[1]	1.8	1.2	1.6	1.6	1.0	1.9	2.0	0.7
DE Conc.[2]	1500	1500	1150	1225	1300	1150	1225	1300
CP/DE[3]	0.0823	0.0837	0.0826	0.0837	0.0837	0.0771	0.0771	0.0837
Cost $(S/T)	39.40	39.11	41.64	47.88	52.95	59.60	66.58	73.33

[1] Includes calcium, phosphorus and salt at levels that satisfy specifications in the model.

[2] Kcal. of DE per pound of feed.

[3] Pounds of CP per Meal of DE.

turn-over rate is not a factor in selection of a feeding program provided animals are finished in less than 10 to 11 months. This is a common feature of areas where fall-weaned calves constitute the bulk of the feeder supply. (2) Concerning the custom feedlot, feedlot operating costs are prorated on the basis of a daily charge of 10 cents a head.

EMPIRICAL RESULTS

Least-Cost Diets

The composition of the least-cost diets depends on the relative prices of ingredients and on the nutrient requirements for the restricted and full-fed phases of the alternative feeding programs. Least-cost diets were derived for each of the price situations described above (Table 3). Each diet consists of a low, medium, and high gain component. The amounts of the diets needed depends on the feeding program used in a particular price situation (Table 4).

In price series 1 the price ratios of concentrates to forages were relatively low. The least-cost diets in this situation were high grain diets with energy concentration at the maximum level specified in the model (1500 kilocalories DE per pound). The crude protein (CP) level exceeded the minimum.

The least-cost diets for feed price series 2 were much different than those for feed price series 1. In this situation, the overall price level of ingredients and the ratios of grain to forage prices were higher than in the first set. This resulted in more costly diets with lower grain content than those in the first situation (Table 3). The diets for low, medium, and high rates of gain contained 83, 66, and 51 percent cereal hay, respectively, as compared to little or no roughage in the first situation. The differences among diets reflect the differences in minimum energy concentration specifications for the three diets. Protein content in the low and medium gain diets was above the minimum requirement.

In price series 3, grain and forage prices were higher while protein supplement prices were lower than in series 2. The price of beet pulp was about the same as in

TABLE 4. FEED REQUIREMENTS PER HEAD FOR ALL PHASES OF THREE FEEDING PROGRAMS FOR THREE DIETS

Feeding Program	Diet 1[1]			Diets 2 & 3[1]		
	Low	Medium	High	Low	Medium	High
	lb					
MMH	–	1927	1745	–	2360	2014
LMH	599	973	2157	781	1192	2489
MMM	–	3757	–	–	4600	–

[1] Diets 1, 2, and 3 refer to the least-cost diets for feed price series 1, 2, and 3 in Table 3, respectively.

series 2. The medium and high gain diets in this situation contain beet pulp at the maximum level permitted in the model. Forage and grain content were consistent with the minimum energy concentration limits.

The amounts of the various diets needed per head depends on energy concentration and the particular feeding program used. With the least-cost diets (Diet 1) for price series 1 and the MMH feeding program, 1,927 pounds of the medium gain diet and 1,745 pounds of the full-fed diet are required (Table 4). Larger quantities of diets 2 and 3 are required because of their lower energy concentrations.

The feed cost was $73.13 a head with the least-cost diet for price series 1 and the LMH program (Table 5). If this same diet were used with feed price series 2 and 3, feed would cost $133.39 and $206.93 a head, respectively. The cost advantage derived through re-formulation of the diet as relative ingredient prices change is evident from these figures. If diet 1 were used in a situation when ingredient prices were those in series 2, total feed cost for each head would be $133.39 when it could be $110.71 if diet 2 were used, a difference of $22.68 a head. Similarly, if diet 1 were used when ingredient prices were those in series 3 the feed cost a head would be $206.93 rather than the $154.22 that it could be if diet 3 were used. The difference in this case is $52.71 a head.

TABLE 5. FEED COST PER HEAD FOR THE LMH FEEDING PROGRAM FOR THREE FEED PRICE LEVELS AND THREE DIETS

	Model Formulated Diets		
Price Series	1	2	3
1	73.13	85.24	100.40
2	133.39	110.71	130.47
3	206.93	171.02	154.22

The linear programming solutions indicate the range over which the price of each ingredient used can vary without changing the composition of the diet (Table 6). The ranges indicate the sensitivity of least-cost diets to ingredient price changes. Since the specifications for low, medium, and high gain diets differ, the cost ranges can also differ. Price changes within the indicated ranges would change the cost of the diet but not its composition, hence no re-formulation is warranted until prices exceed the ranges. The model indicates the nature of the change that would occur at the limits of the cost range. With diet 2, for example, the model shows that if the price of oats declined to the lower limit, with no changes in other prices, oat content would be at the minimum level specified in the model. Given the diet specifications of the model, oats was competitive with barley when its price on a cwt basis was roughly 12 percent lower than that of barley.

TABLE 6. COST RANGES FOR MAJOR INGREDIENTS

			Low Gain Diet		High Gain Diet	
Ingredient	Unit	Original Price	Lower Limit	Upper Limit	Lower Limit	Upper Limit
			Diet 2			
Barley	cwt	3.35	2.23	3.80	2.05	3.77
Oats	cwt	3.71	2.81	19.52	2.77	31.61
Cereal Hay	ton	30.00	—	37.34	—	38.78
Urea	cwt	5.45	—	—	—	53.71
			Diet 3			
Barley	cwt	5.33	—	—	4.81	5.47
Oats	cwt	5.38	4.44	7.11	4.43	6.65
Beet Pulp	cwt	3.20	3.10	3.39	1.83	3.49
Rape Meal	cwt	5.60	—	—	5.09	5.79
Cereal Hay	ton	47.00	45.53	47.83	45.18	50.89
Straw	ton	26.00	24.44	28.60	—	—

Diet 3 was fairly sensitive to some price changes. A 15 cents a cwt increase in the price of barley would result in a reduction in barley content. Beet pulp content would be less than the 30 percent maximum in the high gain diet if its price increased by $0.30 a cwt.

In addition to the cost ranges for feeds in the optimal diets, the model calculates the price reductions necessary for use of feeds not in the least-cost diets (Table 7). These figures show, for example, that for price series 2, wheat would be used in the diet if its price were about $0.45 a cwt lower.

The price reductions necessary for use of protein supplements were very large for price series 2. The protein requirements specified in the model were met more economically with other ingredients (barley, urea). The "reduced prices" for protein supplements reflect their value as energy sources. Rapeseed meal was used in the medium and high gain diets for price series 3 to satisfy the protein requirements.

Forage prices would need to be $9-$11 a ton lower before forage would be used in diet 1. With the higher ratios of grain to forage prices in price series 2 and 3, forages were used in the least-cost diets. The price reductions needed for use of alfalfa hay remained high, suggesting that for the price situations examined, cereal

TABLE 7. PRICES NECESSARY FOR USE OF SOME FEEDS NOT IN OPTIMAL DIETS

Ingredient	Unit	Price Series 2			Price Series 3		
		Original Price	Low & Medium[1]	High[1]	Original Price	Low	Medium & High
		$					
Barley	cwt	3.35	–	–	5.33	3.89	–
Wheat	cwt	3.85	3.39	3.42	6.47	3.95	5.42
Corn	cwt	5.00	3.68	3.61	6.65	4.05	5.73
Beet Pulp	cwt	3.30	2.87	2.91	3.20	–	–
Molasses	cwt	2.40	1.75	1.68	3.00	2.31	2.67
Soybean Meal	cwt	27.00	3.50	4.49	7.75	4.75	6.28
Rapeseed Meal	cwt	14.85	3.16	3.85	5.60	4.30	–
Alfalfa Hay	ton	50.00	26.43	29.80	60.00	53.87	49.35
Straw	ton	20.00	8.48	5.71	26.00	–	11.06

[1] Refers to low, medium, and high gain diets.

hay and in some cases, straw, had a substantial advantage over other forages.

Optimal Feeding Programs

The optimal feeding program depends on: (1) price differentials among grades; (2) feed efficiency and carcass quality differences among programs; and (3) assumptions made regarding feedlot operating costs (Table 8). Feeding programs that involved restricted feeding were selected in all feed and steer price situations examined. The LMH program was selected in price series 1 and 3 and MMH was selected in price situation 2. The differences are due mainly to differences in price differentials among grades in the three price situations. Changes in price differentials would result in selection of still other feeding programs. Low price differentials favor the feeding programs with proportions of A3 and A4 carcasses (HHH, LLH, and MHH). In this case, feed efficiency and costs associated with differences in length of feeding period become relatively more important in selecting the optimal program. Larger price differentials favor the feeding programs in which gains were restricted over a larger proportion of the feeding period (LMH, HML and MMM).

With price series 1, the addition of a custom feeding charge of 10 cents a head per day resulted in a situation in which gross returns were not sufficient to defray feed, feeder purchase, interest, and custom feeding charges. The optimal solution then was to cease operation of the feedlot.

The "reduced costs" indicate the competitive position of the various feeding programs in each price situation. An increase in revenus or reduction in costs of the amount indicated for a particular program would result in the inclusion of that program in the optimal solution. In price situation 1, with price differentials of $3.50 a cwt ($2.00 a cwt live basis) between grades, the MMM program is the "next best" alternative to the selected program, LMH. Under conditions of small price differentials, high feed efficiency and a short feeding period are more important than grade distribution in program selection. Thus, in price situation 2, the competitive position of alternatives with these characteristics improves (MMH, LHH, MHH, and HHH). In price situation 3, where absolute price differentials are the same but relative price differentials are lower than in price situation 1, the advantage again shifts toward the feeding alternatives that produce high proportions of A1, and 2 carcasses. The inclusion of the daily custom feeding

TABLE 8. OPTIMAL FEEDING PROGRAMS FOR THREE PRICE SITUATIONS AND TWO FEEDLOT OPERATION SITUATIONS

	Feedlot Operating Costs					
	All Fixed[1]			Some Variable[1]		
Price Situation	1	2	3	1	2	3
Feeding Program	LMH	MMH	LMH	–	MMH	LMH
"Reduced Costs" for Other Programs						
	dollars a head					
LHH	11.83	.75	8.67	–	1.82	6.77
MHH	14.75	4.52	9.82	–	3.42	6.62
MMH	9.04	–	2.61	–	–	.51
LMH	–	–	–	–	3.00	–
HML	5.54	6.30	10.30	–	12.25	11.60
MMM	.82	5.97	3.95	–	9.97	5.85
HHH	7.78	3.86	8.03	–	1.76	3.83
LLH	8.40	5.86	12.40	–	12.09	14.60

[1] Refer to assumptions about feedlot operating costs for descriptions of "fixed" and "variable".

charge (e.g., some operating costs become time-dependent) improves the competitive position of those activities in which the feeding period is of short duration (HHH, LHH, MHH).

THE NEXT STEP

Feeding experiments with Hereford steer calves that were fed high energy rations at varying rates and marketed at a pre-selected final weight formed the basis for the linear programming model. The digestible energy (DE) system of evaluating feeds and animal requirements formed the basis of the model. Other specifications in the model were based on literature values and industry practices.

Within the limited set of feeding alternatives in the model and given the price differentials among grades that have occurred over the 1972-74 period, restricting rates of gain over a large proportion of the feeding period appears more profitable than full feeding. This outcome may, however, be valid only for this set of alternatives for the particular breed used in the feeding experiments. Other alternatives, such as feeding to lighter weights or to a constant finish rather than to a constant weight, may produce a higher net return. In other words, the current model is only one step toward a package that could be used for a feeding program selection and diet formulation for a wide range of sizes and types of feeder cattle. Other feeding trials are necessary to delineate the performance characteristics of other classes of feeder cattle under a wide range of alternative feeding programs.

The ration formulation sub-model assumes that animal performance will be identical on diets that are the same in terms of nutrient composition but different in ingredient composition. Many of the specifications in the model are intended to ensure that this is a reasonable assumption. Feeding trials with model-formulated diets are necessary to substantiate this assumption[6].

The results reported above indicate that high forage diets were more profitable than high grain diets for the price relationships that prevailed during 1973 and 1974. The present model assumes that feed processing and delivery costs on a weight basis are the same for both forages and concentrates. It is likely that investment and operating costs are higher for a feedlot or feed mill that is equipped to handle large quantities of forage than for one that utilizes high concentrate diets. Implementation of restricted gain feeding programs (e.g., LMH) may also involve higher investment and operating costs than full-fed diets.

A principal user of the kinds of information generated by the model should be the cattle feeder. The model is adequate in its present form.

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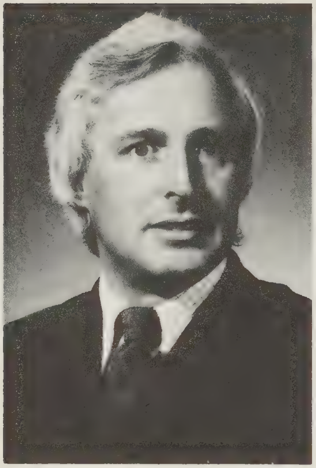
[6] A feeding trial designed to test model-formulated diets was begun in the fall of 1974 at the Agriculture Canada Research Station, Lethbridge. Other trials to expand and refine the model are expected in subsequent years.

FARM AND OFF-FARM INCOMES OF FARM FAMILIES IN CANADA*



The average family income ($6,486) of farm family units in 1971 was lower than that of non-farm family units. Net off-farm income comprised $4,866 of the total.

The incomes reached their peak in the 25 to 34 age class, with a strong negative correlation between income and age of family head. Education of the family head and income were positively correlated.

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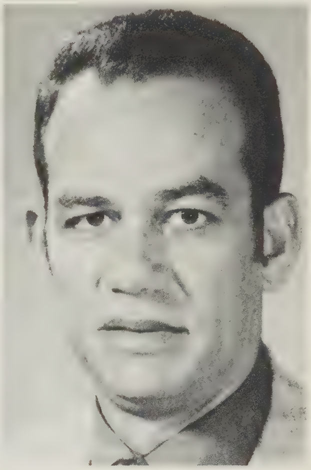

INTRODUCTION

Analyses of the income situation of Canadian farm families appear to be popular among agricultural economists. Two recent articles in Canadian Farm Economics have dealt with various aspects of the farm family income situation: in December 1973, R.D. Bollman (1) presented data on the off-farm income of farm families in 1971 derived from the 1972 Agriculture Enumerative Survey, while in February 1974, W.L. Porteous (2) used tax filer data to describe some of the income relationships which existed in the Canadian farming industry, also in 1971.

The present article is based on an analysis of data from the 1971 Consumer Finance Survey conducted by Statistics Canada. In a sense, it represents an "amalgamation" of the material presented by Bollman and Porteous, since Bollman's article was concerned with only off-farm incomes of census farm families, while Porteous dealt with the total income situation of farm taxfilers rather than farm families. (It should be emphasized that there are important conceptual differences between the various sources of income data; no attempt has been made to reconcile these differences in this article). More particularly, the article reports for 1971 on the level and distribution of farm and non-farm incomes, the impact on incomes of socio-economic factors such as age and educational level of the family head, and the sources of farm family incomes.

THE CONSUMER FINANCE SURVEY

The Consumer Finance Survey (CFS) is a valuable source of information on the distribution of incomes between farm families, on the composition of farm family incomes from both farm and off-farm sources and on urban, rural non-farm and rural farm comparisons. In addition, it can provide data on the relationship of various socio-economic factors (such as the age and education level of the family head) with family incomes. Since 1965, the survey has included farm family units and can now be regarded as a representative sample of virtually all private households in Canada. The 1971 CFS comprises 23,723 sampled family units[1] of which 1,935 resided on farms.

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[1]The term "family unit" is used to designate, collectively, unattached individuals and families with two or more members.

TABLE 1. ESTIMATED NUMBER OF FAMILY UNITS AND AVERAGE FAMILY INCOME BY REGION AND URBANIZATION CATEGORY IN CANADA, 1971

Region		Urban	Rural Non-farm	Rural Farm	Total
Atlantic	Family units ('000)	323	229	23	575
	Family income ($)	7,780	5,749	5,033	6,860
Quebec	Family units ('000)	1,551	200	78	1,829
	Family income ($)	8,912	6,458	6,292	8,532
Ontario	Family units ('000)	2,171	231	111	2,513
	Family income ($)	10,086	8,545	8,016	9,853
Prairies	Family units ('000)	882	89	176	1,148
	Family income ($)	8,549	6,310	5,555	7,914
British Columbia	Family units ('000)	643	100	29	772
	Family income ($)	9,357	8,257	8,022	9,165
Canada	Family units ('000)	5,570	849	417	6,836
	Family income ($)	9,298	7,030	6,486	8,845

The income measured in the survey consists of the total monetary receipts from wages and salaries, net income from self-employment (including net farm income), investment income, government transfer payments and miscellaneous income. Income-in-kind, however, is excluded, although it is important. Income-in-kind, particularly housing, represents a substantial proportion of aggregate net farm income (about 21 percent in 1971 for Canada as a whole).(3)

So far as urbanization is concerned, urban areas include centres with populations of 1,000 and over and the remaining areas comprise the rural population within rural areas. Those family units residing on farms[2] were classified as rural farm families for the purposes of this analysis. However, this definition is somewhat unsatisfactory since it excludes farmers who live in towns and may include non-farm families who reside on farms. A definition which combines the residence criterion with an income criterion may be a more satisfactory way of identifying farm families.

URBAN - RURAL INCOME COMPARISONS

Information on the estimated number of family units and average family income by region and urbanization category in 1971 is given in Table 1. The national average family income in 1971 is shown to be $8,845. However, there were substantial variations in average family incomes among regions and urbanization categories. On a regional basis, average family income ranged from $6,860 in the Atlantic Region to $9,853 in Ontario. By urbanization category, the average family income ranged from $6,486 for rural farm family units to $9,298 for urban family units.

Statistical analysis of these data using the "t" statistic[3] demonstrated that average urban family incomes were significantly different from rural non-farm and rural farm family incomes in all regions except British Columbia. However, with the exception of the Atlantic Region, average rural farm income was not statistically different from rural non-farm income. This must be borne in mind in interpreting the data in Table 1. It must be remembered also that income-in-kind is excluded from the estimates of income.

In addition to studying average income levels, it is also pertinent to examine the distribution of income among family units. Information on the distribution of family units and family incomes by urbanization category and income class is given in Table 2. This shows that in 1971 about 50 percent of rural farm family units in Canada had money incomes below $5,000, compared with 29 percent of urban family units and 41 percent of rural non-farm family units. Thus, the proportion of low income family units in farm areas is greater than in non-farm areas. Moreover, the distribution of farm

[2]The definition of a farm is identical to that used in the Agricultural Census. A census farm is defined in the 1971 agricultural census as a farm, ranch or other agricultural holding of 1 acre or more with sales of agricultural products of $50.00 or more in the 12-month period prior to the census.

[3]For further details see the Economics Branch Publication by B.H. Davey, Z.A. Hassan and W.F. Lu; Farm and Off-Farm Incomes of Farm Families in Canada, Pub. No. 74/17, Economics Branch, Agriculture Canada, p. 39-40.

TABLE 2. CUMULATIVE PROPORTIONS OF FAMILY UNITS AND FAMILY INCOMES BY URBANIZATION CATEGORY AND INCOME CLASS IN CANADA, 1971

	Urban		Rural Non-Farm		Rural Farm		Total	
Income Class	Family Units	Income	Family Units	Income	Family Units	Income	Family Units	Income
Under $1,000	4.7	0.2	5.2	0.3	9.9	0.1	5.1	0.2
1,000 – 1,999	12.0	1.4	15.2	2.5	18.9	2.0	12.8	1.5
2,000 – 2,999	17.3	2.8	23.3	5.4	29.7	6.2	18.8	3.2
3,000 – 3,999	23.5	5.1	32.9	10.1	41.3	12.4	25.8	6.0
4,000 – 4,999	29.0	7.8	40.6	15.1	49.8	18.3	31.7	9.0
5,000 – 5,999	35.0	11.3	49.1	21.7	58.2	25.4	38.2	13.0
6,000 – 6,999	41.3	15.7	56.6	28.7	65.5	32.7	44.7	17.8
7,000 – 7,999	47.7	20.9	63.3	35.7	71.6	39.8	51.1	23.2
8,000 – 8,999	54.8	27.4	70.7	44.7	76.3	45.8	58.1	29.9
9,000 – 9,999	61.1	33.8	76.9	53.0	69.6	50.7	64.2	36.5
10,000 – 11,999	73.1	47.9	86.4	67.9	86.4	62.1	75.5	50.5
12,000 – 14,999	85.3	65.3	93.8	81.9	92.5	74.6	86.8	67.3
15,000 – 24,999	97.5	89.2	99.2	95.7	98.8	93.0	97.8	90.0
25,000 & over	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

family incomes was more unequal than those of non-farm family incomes. This is clear from Table 3 which shows Gini ratios by urbanization category and region, and Figure 1 which illustrates the distribution of incomes of urban and rural farm family units in 1971. A Gini ratio is a statistical measure of income distribution; the higher the ratio the more unequal is the distribution of income. Table 3 shows that the Gini ratio estimated for rural farm family units in Canada (0.46) was greater than those for urban family units (0.39) and rural non-farm family units (0.39). This indicates that the distribution of income within farm family units was more unequal than that within non-farm family units. Similar observations apply to each region. These are only observed differences; tests have not been made to indicate whether these differences are statistically significant.

In summary, average income levels of farm family units in 1971 were below those of non-farm family units, there was a higher proportion of low income families among rural farm families and the income distribution of farm family units was more unequal than that of non-farm family units. However, the analysis is based solely on monetary income; inclusion of income-in-kind would change the situation somewhat, making the comparisons more favourable to the rural farm category. Income-in-kind is an important component of income for farm families; in 1971, income-in-kind averaged $1,481 for each census farm, composed of rental value of the farm house ($1,201) and food produced and consumed on the farm ($280).(4)

REGIONAL DISPARITIES IN FARM FAMILY INCOMES

The level and distribution of farm family incomes by region are compared in Table 4. This shows that average farm family income in Ontario and British Columbia was well above the national average of $6,485. In Quebec, farm family incomes were slightly below the national average, while in the Atlantic and Prairie Regions they were substantially less than the national average. These

TABLE 3. INCOME DISTRIBUTION IN CANADA, 1971: GINI RATIOS BY REGION AND URBANIZATION CATEGORY

Region	Urban	Rural Non-Farm	Rural Farm	Total
Atlantic	.380	.378	.403	.390
Quebec	.400	.389	.417	.404
Ontario	.377	.357	.450	.380
Prairies	.392	.403	.472	.411
British Columbia	.412	.384	.458	.411
Canada	.392	.389	.462	.400

TABLE 4. RURAL FARM FAMILY INCOMES BY REGION, 1971

Region	Mean Income $	Gini ratio	Percent of Family Units with less than $5,000 income
Atlantic	5,033	.408	62.3
Quebec	6,292	.417	50.6
Ontario	8,016	.450	38.2
Prairies	5,555	.472	57.3
British Columbia	8,022	.458	36.0
Canada	6,486	.462	49.8

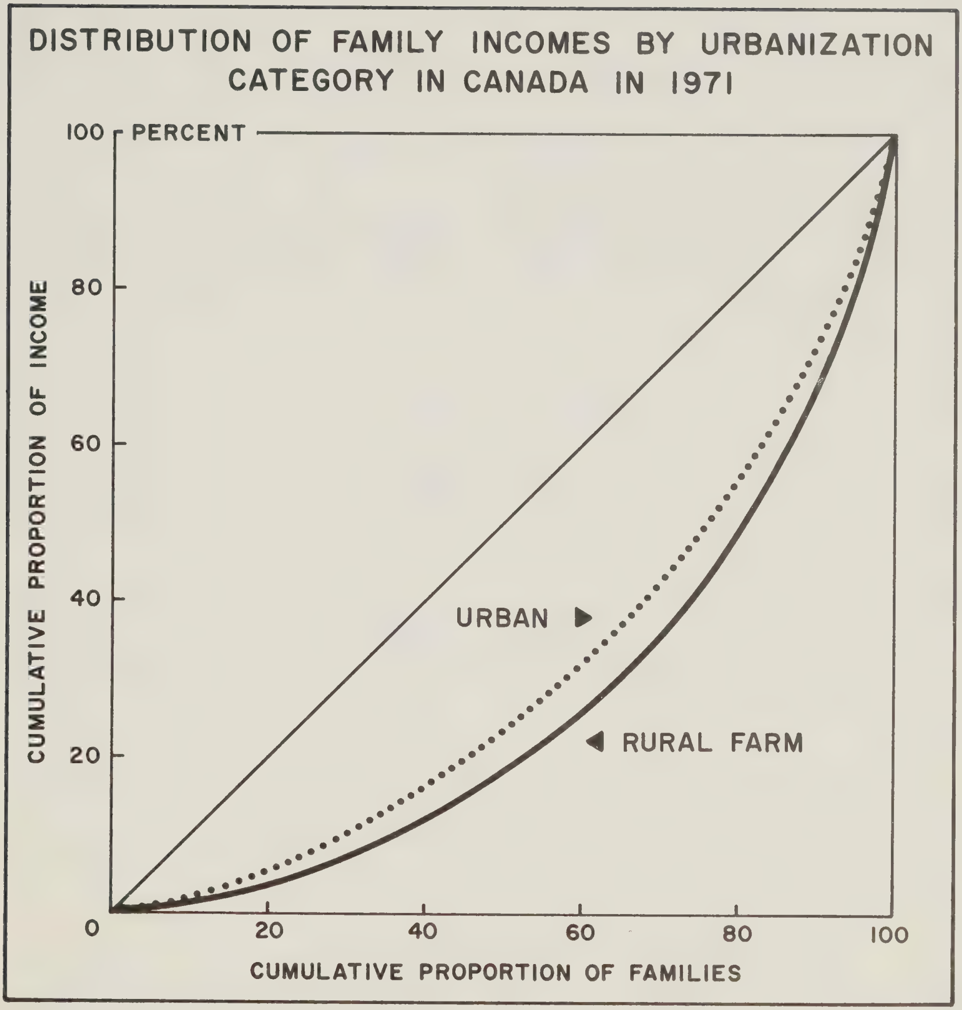
DISTRIBUTION OF FAMILY INCOMES BY URBANIZATION CATEGORY IN CANADA IN 1971
100 PERCENT
80
60
40
20
0
CUMULATIVE PROPORTION OF INCOME
URBAN
RURAL FARM
20
40
60
80
100
CUMULATIVE PROPORTION OF FAMILIES

Figure 1

two regions, and especially the Atlantic Region, had a much higher proportion of low income farm families than the rest of the country. So far as the distribution of incomes was concerned, the degree of inequality was high within Prairie farm family units as compared to the remainder of the country. As shown in Table 4 the magnitude of the Gini ratio for Prairie farm family units was greater than the comparable figure for other regions.

IMPACT OF SOCIO-ECONOMIC FACTORS ON INCOME LEVEL AND DISTRIBUTION

It has been shown that there were substantial disparities in family incomes among urbanization categories and regions in Canada. The factors responsible for these disparities include inter-regional variations in the productivity, skill and education of the labour force, the industrial structure, the availability of natural resources, the extent of urbanization and the age structure of the population. The following paragraphs examine the association of the age and education of the family head with the overall level of income and income distribution.

So far as the impact of the age of family head is concerned, Table 5 shows that the average family income for rural farm family units reached its highest level of $7,481 in the 25 to 34 age class, whereas for all family units the highest average incomes were recorded in the 35 to 44 class. After reaching their peak, a strong negative correlation existed between income and age of family head. For rural farm family units, the internal differential in incomes was lowest among the 35 to 44 age group, but the relationship of age to income inequality was not significant. However, for all family units, incomes became more unequally distributed as age increased.

TABLE 5. IMPACT OF AGE OF HOUSEHOLD HEAD ON THE LEVEL AND DISTRIBUTION OF FAMILY INCOMES IN CANADA, 1971

	Rural Farm Family Units		All Family Units	
Age (years)	Mean Income $	Gini ratio	Mean Income $	Gini ratio
14-24	*	*	*	*
25-34	7,481	.467	9,353	.306
35-44	7,247	.391	10,970	.331
45-54	6,919	.427	10,909	.361
55-64	6,787	.511	9,210	.436
65 and over	4,678	.403	5,115	.460
All age groups	6,486	.462	8,845	.400

*Sample size too small for reliable estimate.

In recent years, economists have turned their attention to the role of human resources in economic development. It has been postulated that the more highly educated the worker, the higher the income streams received. The data in Table 6 tend to confirm this hypothesis since the magnitude of family incomes and the level of education are positively correlated. For rural farm family units, the average income of $8,484 of those whose heads completed high school was substantially greater than those whose heads did not. In addition, the internal differentials of family incomes were greater among the poorly educated farmers than among the better educated ones, although this is a very heterogenous group.

TABLE 6. IMPACT OF EDUCATION OF HOUSEHOLD HEAD ON THE LEVEL AND DISTRIBUTION OF FAMILY INCOMES IN CANADA, 1971

	Rural Farm Family Units		All Family Units	
Education level	Mean Income $	Gini ratio	Mean Income $	Gini ratio
Some highschool or less	5,990	.463	7,573	.396
Highschool complete	8,484	.395	9,662	.355
University degree	*	*	15,746	.401
Total	6,483	.462	8,845	.400

*Sample size too small for reliable estimate.

LEVEL AND SOURCES OF FARM FAMILY INCOMES

The total income of farm family units is the sum of net farm income and off-farm income of all family members. It is a measure of the total economic power of the family unit. Net farm income is that received by farmers and their families from farming operations; it is defined as the difference between farm cash receipts, and farm operating expenses and depreciation of farm assets. Off-farm income includes wages and salaries, non-farm self-employment income, investment income, government transfers and other incomes.

Information on the distribution of rural farm family units by income class and region is presented in Table 7. This shows that a relatively large proportion of farm family units in the Atlantic and Prairie Regions, 72 and 66 percent respectively, had total incomes below $6,000. By contrast, a smaller proportion of farm family units in Ontario and British Columbia, 47 and 40 percent, had incomes of less than $6,000. In these latter regions, more than one third of rural farm families received incomes of $9,000 and over in 1971, compared

TABLE 7. DISTRIBUTION OF RURAL FARM FAMILY UNITS BY INCOME CLASS AND BY REGION IN CANADA, 1971

Income Class $	Atlantic	Quebec	Ontario	Prairies	British Columbia	Canada
			— percent —			
Under 3,000	33	26	24	35	29	30
3,000 – 5,999	39	34	23	31	11	28
6,000 – 8,999	14	18	20	17	22	18
9,000 and over	14	22	33	18	38	24

with about one sixth in the Atlantic and Prairie Regions. Quebec occupied an intermediate position between the two extremes.

It has already been shown above that the total income of farm family units in Canada in 1971 averaged $6,486. Table 8 indicates that this was made up of $1,620 in net farm income and $4,866 in net off-farm income. On average, net farm income accounted for only 25 percent of the total income of rural farm family units. However, the ratio of net farm income to total farm family income varied from 16 percent in the under $3,000 income class to 30 percent in the $3,000 to $5,999 income class. The regional differentials in the ratio of net farm income to total income were quite substantial, varying from 6 percent in British Columbia to 39 percent in the Prairies.

The major sources of off-farm income of farm family units in Canada in 1971 were wages and salaries ($3,398), government transfers ($679), investment income ($423) and non-farm self-employment income ($331). These components together accounted for about 73 percent of total farm family income or 97 percent of net off-farm income. The single most important source of farm family income was wages and salaries. Moreover, the magnitude of total family income and that of wages and salaries was strongly correlated, the ratio of wages and salaries to total income increasing from 26 to 62 percent from the lowest to the highest income class. This indicates that high farm family incomes are primarily attributable to high incomes earned from wages and salaries.

After wages and salaries and net farm income, government transfers were the third most important source of total farm family incomes. (It should be noted that some government payments will be included in net farm income.) The variation in the amount of government transfers among the various income classes was not great, but the relative importance did vary between income classes. For example, money receipts from government transfers were only 3 percent for the top income class but accounted for 40 percent of the income of low income families (Table 8). On a regional basis, government transfers were more important in Eastern Canada on both an absolute and relative basis (Table 9).

TABLE 8. FARM FAMILY INCOME BY SOURCE OF INCOME AND INCOME CLASS IN CANADA, 1971.

Income Source	Under $3,000	$3,000-5,999	$6,000-8,999	More than $9,000	All classes
		— $ per family unit —			
Net farm income	216	1,307	2,067	3,413	1,620
Wages and salaries	344	1,481	3,895	9,150	3,398
Non-farm self-employment income	53	293	306	742	331
Investment income	162	352	352	888	423
Government transfers	535	845	642	480	629
Other incomes	33	101	81	133	85
Total	1,343	4,379	7,343	14,806	6,486

TABLE 9. FARM FAMILY INCOME BY SOURCE OF INCOME AND REGION IN CANADA, 1971

Income Source	Atlantic	Quebec	Ontario	Prairies	British Columbia	Canada
			– $ per family unit –			
Net farm income	579	1,506	1,357	2,149	531	1,620
Wages and salaries	2,939	3,076	5,002	2,227	5,678	3,398
Non-farm self-employment income	334	413	320	253	621	331
Investment income	222	204	668	362	610	423
Government transfers	925	998	555	575	371	629
Other incomes	34	95	114	49	211	85
Total	5,033	6,292	8,016	5,555	8,022	6,486

The distribution of farm family units reporting each source of income by region is shown in Table 10. In Canada, 62 percent of farm family units reported incomes from farming. In the Atlantic Region only 34 percent of farm family units reported that they had net farm income, compared with 76 percent in the Prairies. This is a measure of the usefulness, or otherwise, of the definition of a farm family unit used in this study. Defining farm family units as those resident on farms, even though the concept of a farm is identical to that used in the agricultural census, clearly includes family units not normally regarded as members of the farm sector in that they have no income from farming.

The most frequent source of off-farm income reported by farm family units was government transfers. More than three quarters of Canadian farm families received government transfer payments in 1971. Wages and salaries and investment income were reported by 58 and 46 percent of farm family units respectively.

SUMMARY

This article has reported for 1971 on the level and distribution of farm and non-farm family incomes, the impact of socio-economic factors on the level and distribution of farm family incomes, and the sources of farm family incomes. It was based on an analysis of the 1971 Consumer Finance Survey conducted by Statistics Canada.(5)

Average family income of farm family units was lower than that of non-farm family units. Moreover, income distribution was more unequal for rural farm family units than for non-farm family units. The relative position of farm family units would be improved, however, if income-in-kind and wealth were considered along with money incomes.

Total incomes of farm family units in 1971 average $6,486, comprising $4,866 of net off-farm income and

TABLE 10. DISTRIBUTION OF FARM FAMILY UNITS BY SOURCE OF INCOME AND REGION IN CANADA, 1971

Income source	Atlantic	Quebec	Ontario	Prairies	British Columbia	Canada
			– percent –			
Net farm income	34	58	55	76	43	62
Wages and salaries	63	58	65	51	70	58
Non-farm self-employment income	15	16	10	9	13	11
Investment income	36	34	52	48	50	46
Government transfers	80	87	72	74	63	76

$1,620 of net farm income. Farm family incomes were higher than the national average in Ontario and British Columbia and lower in the Atlantic and Prairie Regions. These low income regions had a higher proportion of low-income farm families.

The major sources of off-farm income were wages and salaries, government transfers, investment income and net non-farm self-employment income. The most frequent source of off-farm income was government transfers.

Average incomes for rural farm family units reached their peak in the 25 to 34 age class. Thereafter, a strong negative correlation existed between income and age of family head.

Farm family incomes and the level of education of the family head were positively correlated.

This analysis has been based on 1971 data. In interpreting the results, the state of the economy during that year must be borne in mind. In particular, 1971 was a poor year so far as income from farming was concerned. Analysis of data for subsequent years is needed in order to monitor satisfactorily the relative and absolute income situation of Canada's farm population.

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COMBINE SIZES FOR LEAST-COST CEREAL HARVESTING

Factors relevant in determining the least-cost combine size are the purchase price, rated capacity, owning, operating, and labor cost, acreage to be harvested, and the time available to harvest the crop before natural loss becomes serious.

It is not always "least-cost" to operate a combine at its rated capacity. The least-cost combine size is specific to each crop production situation.

*J.A. McIsaac and J. Lovering**

INTRODUCTION

The costs incurred in combining cereals include owning and operating the combine, labor, natural crop loss that occurs after the optimum time of harvest has passed and loss of crop due to the combine itself (header and tail losses).

For a specified acreage, per acre costs for labor and natural crop loss decrease with combine size, and hence, ownership cost increases. Combine losses are a function of combine throughput an hour and rated capacity.

The cost or value of natural and combine crop losses is a highly stochastic variable linked directly with the market price of the cereal being harvested. Combine throughput can be in excess of rated capacity, incurring greater combine losses but reducing the natural losses incurred in harvesting a particular acreage.

The general problem is to choose the size of combine for which the sum of these various costs is a minimum for a particular crop production situation. The purpose of this paper is to: (1) describe an algorithm for estimating the least-cost combine size for particular crop production situations; (2) indicate least-cost combine sizes for various situations and (3) show the relationships between variables that determine least-cost combine size.

*J.A. McIsaac is an economic analyst assistant and J. Lovering is an economist with the Charlottetown Research Station, Agriculture Canada.

ALGORITHM FOR ESTIMATING CEREAL HARVESTING COSTS

Based on a model developed by Boyce and Rutherford (2), the algorithm described here estimates combining cost as a function of crop acreage, crop yield, combine ownership and operating costs. It also estimates natural crop loss as a function of time and required labor and combine loss as a function of combine throughput and rated capacity, the value of the crop, the length of work-day, the number of harvesting days available before natural loss begins and the length of the harvest season. Transportation, drying and storage costs are not included. The algorithm permits parameterizing all of the included variables except combine ownership and operating costs, which are functions of combine throughput and rated capacity. The algorithm output includes ownership and operating costs, value of natural crop loss and value of combine loss for each set of input values.

The per acre combining costs for each input set are compared to find the least-cost combine size and to find the relationships between variables and the effects that changes in the variables have on combining costs.

The following equation estimates the (1) repair costs; (2) fixed costs; (3) fuel and lubrication costs; (4) labor costs; (5) combining-loss costs and (6) natural crop-loss costs for particular crop production situations:

$$CPA = \left\{ \left(C + \frac{D * AC * YIELD}{GG * FEFF} \right) * \quad (A + (B * CT)) \right. \tag{1}$$

$$+ .14 * (A + (B * CT)) \tag{2}$$

$$+ (G + (H * CT)) * \frac{AC * YIELD}{GG * FEFF} * FUELC * 1.15 \tag{3}$$

$$+ LBCST * \frac{AC * YIELD}{GG * FEFF} \tag{4}$$

$$+ \frac{44.4}{CT^2} * GG^2 * YIELD * AC * \frac{CVAL}{2000} \tag{5}$$

$$\left. * CLFCN * (HDAYS - LFD) * \frac{1}{PR} * AC * \frac{HDAYS - LFD}{HDAYS} * \frac{CVAL}{2000 * 2} \right\} / AC \tag{6}$$

where –

HDAYS = the number of days it takes to harvest the crop

$HDAYS = \frac{AC * YIELD}{GG * FEFF * HPD}$

CPA = combining costs an acre

AC = acres

YIELD = crop yield (tons of grain per acre to be harvested at approximately a 2 – percent grain loss)

GG = combine throughput (tons of straw an hour)*

CT = combine rated capacity (tons of grain an hour at approximately 2 – percent grain loss)*

LBCST = cost of labor ($ an hour)

CVAL = crop value ($ a ton)

CLFCN = natural crop loss rate (lb of grain an acre a day)

LFD = number of working days available to harvest grain before natural crop loss begins

HPD = hours worked a day

PR = 0.6 – probability of a day being a work-day (Prince Edward Island Sept. to Oct. average) (1)

A = $5,000

B = $1,430 – cost per ton an hour of combine capacity (increment over and above A)

A and B are the intercept and slope, respectively, of the curve relating combine capacity (tons/hour) and combine purchase price.

C = 0.005 – repair rate as a proportion of combine price

D = 0.0002 – repair rate per hour of use as a proportion of combine price (increment over and above C)

C and D form the relationship of repair cost over different amounts of combine usage.

G = 1 – fuel consumption in gallons an hour

H = .2 – fuel consumption in gallons an hour a ton per hour of combine capacity (increment over and above G)

G and H form the relationship of fuel consumption for different combine sizes.

FEFF = .75 – combine field efficiency

FUELC = $.40 – cost of fuel ($ a gallon)

The constant .14 in line 2 is the proportion that fixed costs (depreciation, interest, insurance, shelter and taxes) make up of the combine purchase price. The constant 1.15 in line 3 charges lubrication costs as 15 percent of the fuel costs. In line 5, 44.4 is a constant derived from combine loss measurements by Nyborg (5). The pounds of grain lost per ton of straw throughput is 44.4 when the combine is operated at its capacity. Combining losses increase as the ratio of the squares of the combine throughput to combine capacity increases. The 2000 found in lines 5 and 6 convert pounds to tons. Dividing by two in line 6 gives an average crop loss.

The algorithm assumes that natural crop loss and combining begin when the grain has reached a moisture content of 16 percent. This assumption has been made because the only applicable data deal with natural losses after this moisture content has been reached (3). It is also assumed that, after the earliest of the grain reaches a moisture content of 16 percent, the remainder of the grain crop matures evenly over a period of time and any grain harvested in that time has no natural loss associated with it. Since one of the main determinants of least-cost combine size for a specific acreage is natural crop loss, it is important that its extent as a function of time be carefully estimated.

The combine loss function is based on combining losses measured by Nyborg who determined the combining losses that resulted from different throughputs of straw and different grain to straw ratios. The combining losses for a grain to straw ratio of 1:1 was used in this paper because it was considered to be the most frequently occurring value of the ratios. Lower grain to straw ratios result in higher combining losses. Higher grain to straw ratios result in lower combining losses.

Additionally, it is assumed that combine losses (header and tail combined) are approximately 2 percent of crop yield when combine throughput is equal to combine rated capacity. Rated capacity is expressed in terms of straw walker area (Table 1). The new cost of combines is estimated as A + (B * CT).

RESULTS

The following standard conditions, unless otherwise specified, are used in all figures in this paper: yield = 1.5 tons an acre; labor cost = $3.00 an hour; crop value = $80.00 a ton; working time = 6 hours a day; natural crop loss rate = 30 lb an acre a day; LFD = 8 days available to harvest the grain before natural crop loss begins; combine thoughput equals rated capacity; and self-propelled combines.

TABLE 1. THE RELATIONSHIP BETWEEN STRAW WALKER AREA AND COMBINE CAPACITY

Combine capacity (tons of straw/hr)	Straw walker area (ft^2)	Example combine make and model*
5	25-30	MF 300
7.5	35-40	Cockshutt 5542
10	45-50	IH 915
12.5	55-60	JD 7700

*Mention of specific make and model is made solely to aid the reader in understanding relative sizes of combines corresponding to various capacities expressed in terms of tons/hr. There is no guarantee that the specific makes and models will necessarily perform at these rates. No endorsement of named, or criticism of unnamed machines is intended.

SOURCE: D.S. Boyce and I. Rutherford. A deterministic harvester cost model. Journal of Agricultural Engineering Research, (1972), 17, 261-270.

Figure 1 shows the costs of harvesting 200 acres for combines of four different sizes. The combines are operated at their rated capacities so the combine losses are constant on a per-acre basis. The natural losses are higher for the smaller combines because they take longer to harvest the crop than do larger combines. The machine plus labor costs are least for the smallest combine and greatest for the largest. The total cost is the sum of the combine loss cost, natural loss cost and the machine and labor cost.

Figure 2 shows the combine loss costs that can be expected from properly adjusted combines operating at various rates on 200 acres. (A properly adjusted combine is one that is adjusted to approximately a 2 percent combining loss when operated at its rated capacity.) Combines operated at higher than their rated capacities will incur least combining losses if adjusted for operation at capacity. This figure shows that high combining losses occur when combine capacities are exceeded.

Figure 3 shows the costs associated with different sizes of combines working at various rates on 200 acres. In this figure, the lowest point on the curves for 5 tons an hour and the 7.5 tons an hour combines show similar costs. For higher acreages, the lowest point in the curve for smaller combines occurs at throughputs greater than the combine capacity.

As the acreage to be harvested increases, the size of combine that will harvest the crop the most cheaply increases. Figure 4 shows the costs associated with four sizes of combines operated at their rated capacities over a range of acreage.

For acreages less than 200 acres, the 5 tons an hour combine is the least cost one. At 200 acres, the 5 and 7.5 tons an hour combines have the same costs. Between 200 acres and 285 acres the 7.5 tons an hour combine has the least cost. Between 285 and 375 acres the 10 tons an hour combine is the least-cost, and at acreages greater than 375 the 12.5 tons an hour combine is the least-cost.

Changes in the crop production situation from the standard previously stated would cause changes in the least-cost combine size. For example, at 200 acres, if the new cost of the combines was higher, then the 5 tons an hour combine would show lower costs an acre than the 7.5 tons an hour combine. (Both have equal costs at 200 acres in figure 4.) The 7.5 tons an hour combine would be less costly than the 5 tons an hour combine if the value of the crop or the natural crop loss increased. This same relationship holds true for all the crossing points of the least-cost combines shown in this figure.

Figure 5 shows how changes in the natural crop loss rate affect the total combine costs on 100 and 300 acres. On 100 acres, the 5 tons an hour combine is least costly for all of the natural crop loss rates shown. On 300 acres, however, the natural crop loss rate has a much stronger effect on the least-cost combine size. For natural crop

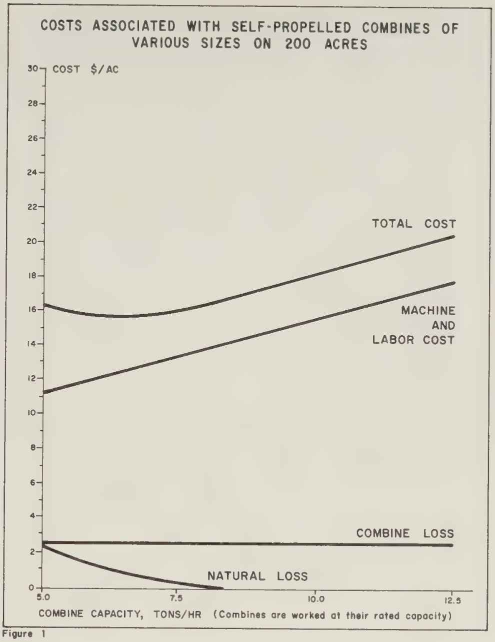
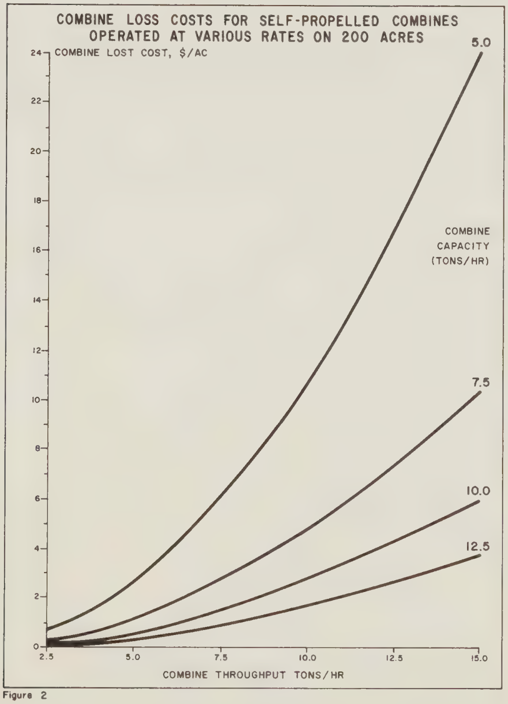


Figure 1



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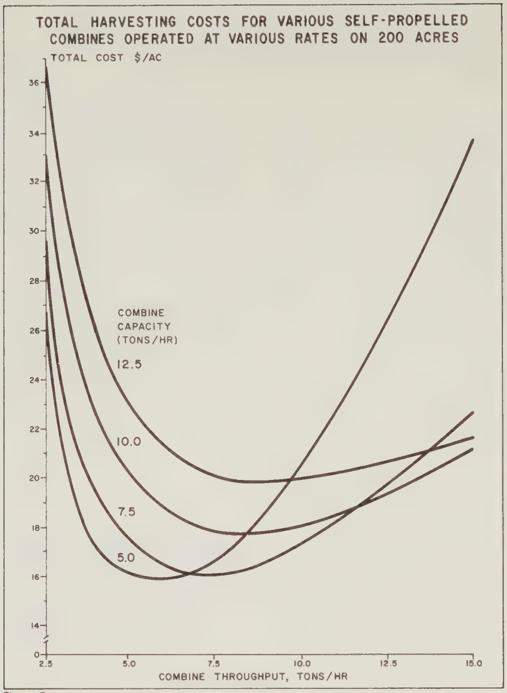

Figure 3

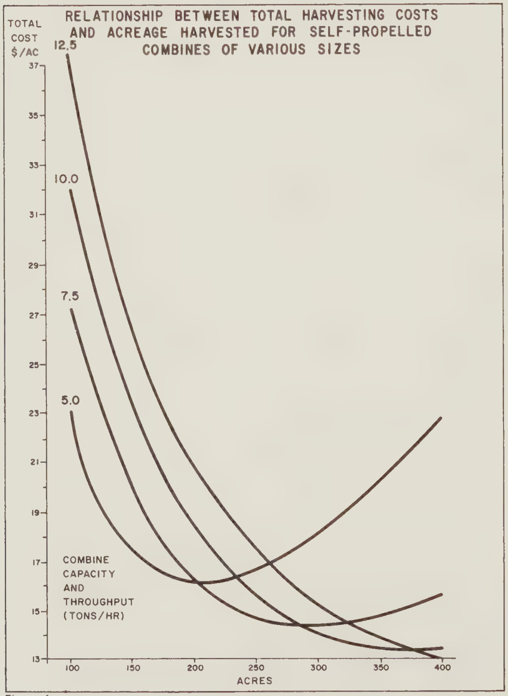

Figure 4

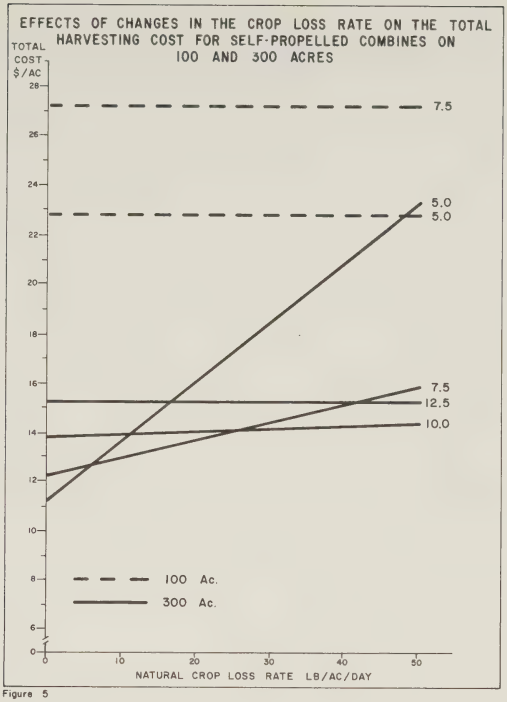

Figure 5

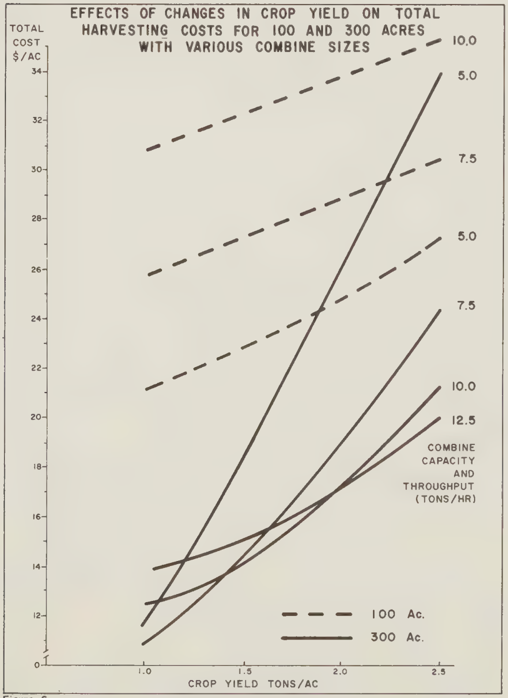

Figure 6

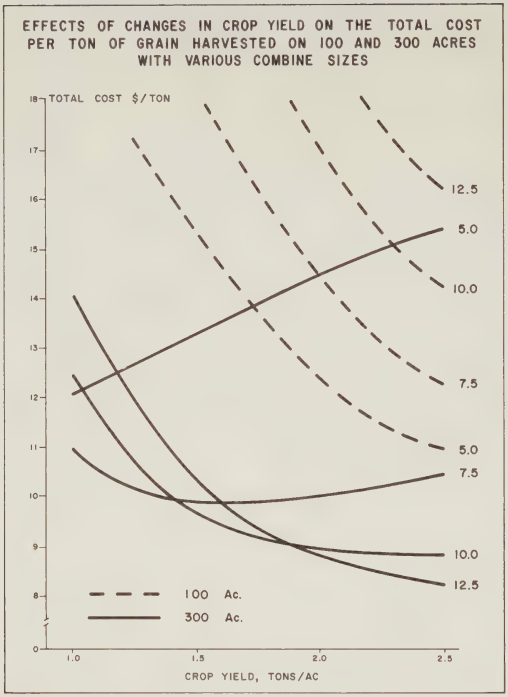

Figure 7

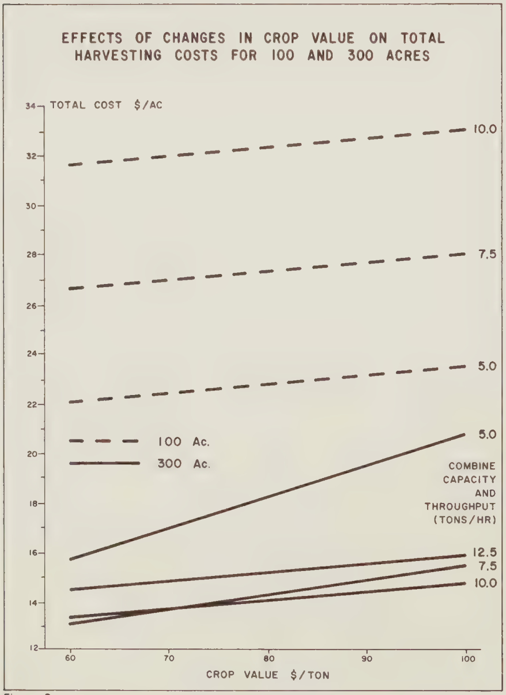

Figure 8

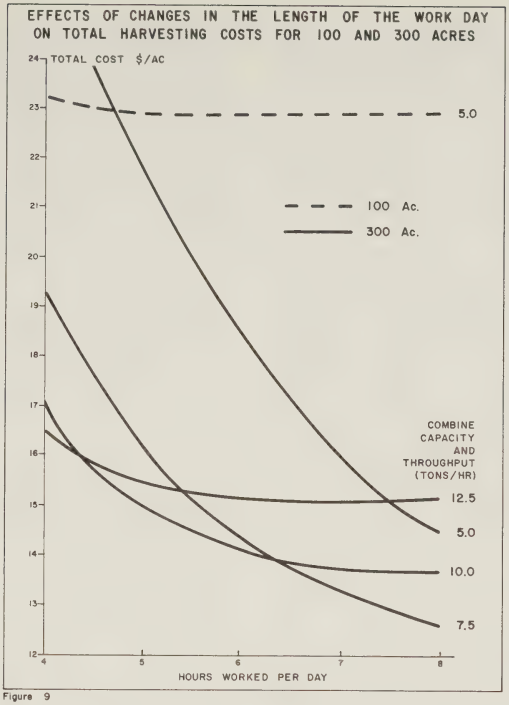

Figure 9

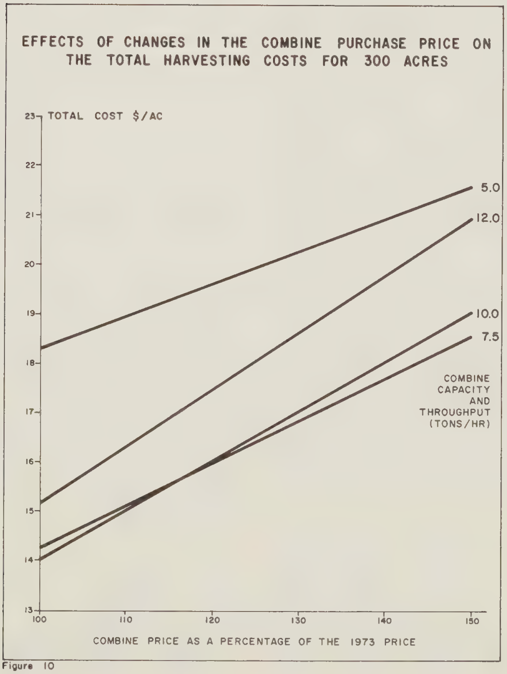

Figure 10

loss less than 6 pounds an acre a day, the 5 tons an hour combine is least costly; when the natural crop loss is between 6 and 26 pounds an acre a day, the 7.5 tons an hour combine is least costly; between 26 and 115 pounds an acre a day the 10 tons an hour combine is least costly, and at natural crop losses greater than 115 pounds an acre a day the 12.5 tons an hour combine is least costly.

Figure 6 shows that crop yield variation affects the least-cost combine size in a fashion similar to variation in the natural loss rate if costs are considered on a per-acre basis. Although it is cheaper per acre to combine low-yielding crops, it is generally cheaper per ton of grain harvested to harvest high-yielding crops, as shown in Figure 7. The 5 tons an hour curve for 300 acres in Figure 7 increases as the crop yield increases because of the high natural losses incurred from working the small combine on 300 acres. This figure shows the costs per ton for harvesting crops for four combine sizes with various yields on 100 and 300 acres. The larger combines are least costly for harvesting higher yielding crops on 300 acres.

The effect that crop value has on the least-cost size of combine can be seen from Figure 8. The more valuable the crop is, the higher the crop loss costs are. At high crop values, the larger combines harvest the crop more cheaply because the larger harvesters permit less of the crop to be lost due to natural causes.

The effects of changing the length of the work day on the least-cost size of combine can be seen in Figure 9. Lengthening the work day lessens the number of days spent harvesting the crop and hence the crop loss by natural causes is less. Working fewer hours a day has the opposite effect.

As the price of combines increases, the costs for the smaller combines increase at a lesser rate than the larger ones. In the case shown in Figure 10, the 7.5 tons per-hour combine is less expensive than the 10.0 tons per-hour combine when the prices are more than 118 percent of the 1973 prices.

TABLE 2. TIME REQUIRED TO HARVEST THE GRAIN CROP

Combine Throughput	100 AC		200 AC		300 AC	
tons/hr	hr	days	hr	days	hr	days
5	40	6.7	80	13.3	120	20
7.5	27	4.4	53	9	80	13.3
10	20	3.3	40	6.7	60	10
12.5	16	2.7	32	5.3	48	8

TABLE 3. HARVESTING COSTS FOR VARIOUS COMBINE CAPACITIES, COMBINE THROUGHPUTS, CROP LOSS RATES, AND CROP VALUES ON 100 ACRES

Combine capacity	Combine throughput	Crop loss rate	Harvesting cost $/ac Crop value $/ton		
tons/hr	tons/hr	lb/ac/day	$60	$80	$100
5	2.5	10	24	24	24
5	2.5	30	25	25	26
5	2.5	50	26	27	28
5	5	10	22*	23*	24*
5	5	30	22**	23**	24**
5	5	50	22***	23***	24***
5	7.5	10	24	25	27
5	7.5	30	24	25	27
5	7.5	50	24	25	27
7.5	5	10	27	27	27
7.5	5	30	27	27	27
7.5	5	50	27	27	27
7.5	7.5	10	27	27	28
7.5	7.5	30	27	27	28
7.5	7.5	50	27	27	28
7.5	10	10	28	29	30
7.5	10	30	28	29	30
7.5	10	50	28	29	30
10	7.5	10	31	32	32
10	7.5	30	31	32	32
10	7.5	50	31	32	32
10	10	10	32	32	33
10	10	30	32	32	33
10	10	50	32	32	33
10	12.5	10	32	34	35
10	12.5	30	32	34	35
10	12.5	50	32	34	35

*Least cost for a crop loss rate of 10 lb/ac/day
**Least cost for a crop loss rate of 30 lb/ac/day
***Least cost for a crop loss rate of 50 lb/ac/day

Investigation of combine factory list prices from Blue Books 1970 to 73 (4), indicates that there are differences in the percentage of the combine list price increases in different years and between companies, but the percentage increase from year to year for different sizes of combine by the same manufacturer is relatively constant. In the examples used in this paper, labor costs make up less than 5 percent of the total cost. Fifty percent changes in the hourly cost of labor do not have much effect.

All the examples are for self-propelled combines. The basic relationships shown are similar for pull-type combines. In most cases, the costs for the pull-type combines are less than for self-propelled ones of the same size working under similar conditions.

Table 2 shows the length of actual working time required to harvest the grain crop for combinations of combine size and crop acreage. The crop yield is 1.5 tons an acre and the working time is 6 hours a day. Tables 3, 4 and 5 show the effects of changes in combine capacity, combine throughput and crop loss function on the combining costs for different acreages and crop values. Conditions not specified in Tables 3, 4 and 5 are standard conditions outlined previously.

For a crop production situation where the combine size is known, the combining costs for that situation can be found from Tables 3, 4 and 5. The least-cost combine size for a specific crop production situation can be found by comparing the combine costs from Tables 3, 4 and 5.

TABLE 4. HARVESTING COSTS FOR VARIOUS COMBINE CAPACITIES, COMBINE THROUGHPUTS, CROP LOSS RATES, AND CROP VALUES ON 200 ACRES

Combine capacity tons/hr	Combine throughput tons/hr	Crop loss rate lb/ac/day	Harvesting cost $/ac Crop value $/ton $60	$80	$100
5	2.5	10	18	19	20
5	2.5	30	24	28	31
5	2.5	50	31	36	42
5	5	10	14*	15*	16*
5	5	30	15**	16	17
5	5	50	16	18	19
5	7.5	10	15	17	18
5	7.5	30	15	17	18
5	7.5	50	15***	17	18
7.5	5	10	16	16	17
7.5	5	30	17	18	18
7.5	5	50	18	19	20
7.5	7.5	10	15	16	17
7.5	7.5	30	15	16**	17**
7.5	7.5	50	15	16***	17***
7.5	10	10	16	18	19
7.5	10	30	16	18	19
7.5	10	50	16	18	19
10	7.5	10	17	18	18
10	7.5	30	17	18	18
10	7.5	50	17	18	18
10	10	10	18	18	19
10	10	30	18	18	19
10	10	50	18	18	19
10	12.5	10	18	20	21
10	12.5	30	18	20	21
10	12.5	50	18	20	21

*Least cost for a crop loss rate of 10 lb/ac/day
**Least cost for a crop loss rate of 30 lb/ac/day
***Least cost for a crop loss rate of 50 lb/ac/day

TABLE 5. HARVESTING COSTS FOR VARIOUS COMBINE CAPACITIES, COMBINE THROUGHPUTS, CROP LOSS RATES, AND CROP VALUES ON 300 ACRES

Combine capacity tons/hr	Combine throughput tons/hr	Crop loss rates lb/ac/day	Harvesting Cost $/ac Crop value $/ac $60	$80	$100
7.5	5	10	13	14	15
7.5	5	30	17	19	21
7.5	5	50	20	24	27
7.5	7.5	10	12*	13*	14*
7.5	7.5	30	13**	14	15
7.5	7.5	50	14	16	17
7.5	10	10	13	14	15
7.5	10	30	13	14	15
7.5	10	50	13***	14	16
10	7.5	10	13	14	14
10	7.5	30	14	15	16
10	7.5	50	15	17	18
10	10	10	13	14	15
10	10	30	13	14**	15**
10	10	50	14	14***	15***
10	12.5	10	14	15	16
10	12.5	30	14	15	16
10	12.5	50	14	15	16
12.5	10	10	14	15	15
12.5	10	30	14	15	15
12.5	10	50	15	15	16
12.5	12.5	10	14	15	16
12.5	12.5	30	14	15	16
12.5	12.5	50	14	15	16
12.5	15	10	15	16	17
12.5	15	30	15	16	17
12.5	15	50	15	16	17

*Least cost for a crop loss rate of 10 lb/ac/day
**Least cost for a crop loss rate of 30 lb/ac/day
***Least cost for a crop loss rate of 50 lb/ac/day

CONCLUSIONS

The grain combine size selection decision is a difficult one to make because of the many factors affecting the costs of harvesting a grain crop. The combine's purchase price, owning and operating costs, labor costs, acreage to be harvested, crop loss costs due to the combine and weather and the time available to harvest the crop before natural loss becomes serious, are all relevant in determining the least-cost combine size.

It is not always "least cost" to operate a combine at its rated capacity. There are circumstances where it is advantageous to operate a combine at a rate higher than its rated capacity and incur higher combining losses and lower natural losses. The least-cost combine size is specific to each crop production situation.

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2. Boyce, D. S. and I. Rutherford. A deterministic combine harvester cost model. Journal of Agricultural Engineering Research. (1972) 17, 261-270.

3. Kemp. J. G. Personal communication, October 1973.

4. National Farm Tractor and Implement Blue Book Valuation Guide, National Market Reports, Inc., Chicago, Illinois.

5. Nyborg, E. O. A Test Procedure for Determining Combine Capacity. Canada Agriculture. Engng. (1964), Vol. 6, No. 1, P. 8.

POLICY AND PROGRAM DEVELOPMENTS

CANADIAN WHEAT BOARD ACT

(Increase of initial payment)

This amendment to the Act implemented an increase of initial payments for the 1974-75 crop year on wheat, oats and barley sold to the Canadian Wheat Board. On November 25, the following rates became effective, basis in store Thunder Bay or Vancouver: #1 Canada Western Red Spring wheat, $3.75 a bu (previously $2.25); #2 Canada Western Oats, $1.20 a bu (previously $1.10); #2 Canada Western Six Row Barley, $2.25 a bu (previously $1.65). (SOR/74-643, November 21).

CROP INSURANCE ACT

(Agreement with Nova Scotia)

The amendment of October 22 to the Crop Insurance Agreement with Nova Scotia included strawberries as an insurable crop (in addition to spring grains, tree fruit, flue-cured tobacco, silage grain, peas and beans and lowbush blueberries). (O.C. 1974-2291, October 22).

FARM PRODUCTS MARKETING AGENCIES ACT

((1) Amendment to the Canadian Turkey Marketing Agency Proclamation)

The Turkey Marketing Agency, established in December, 1973, provided the terms of a marketing plan which applied to all provinces except Newfoundland, New Brunswick and Prince Edward Island. This amendment enabled New Brunswick to become a full participating member of the agreement, through the N. B. Turkey Marketing Board, effective November 5, 1974. (O.C. 1974-2445, November 5).

((2) Amendment to the Canadian Egg Purchasing Levies Order)

Through this legislation the Canadian Egg Marketing Agency reduced the levy payable by the egg producer. The previous purchasing levy was 2 cents a dozen, plus the standard 1 cent for administration costs. This was due to expire on December 14, 1974, but the Board further reduced the purchasing levy to $^1/_2$ percent, and this became effective November 25. The levy, including the administration charge, is now $1^1/_2$ cents a dozen until March 15, 1975. (SOR/74-644, Nov. 26.)

FARM IMPROVEMENT LOANS ACT (Minister of Finance)

(Maximum loan rate)

Until August 6 the maximum loan rate that could be charged was $8^1/_4$ percent for land purchase and 8 percent for other purposes. This was changed by Order in Council to a maximum rate of $9^3/_4$ percent for both purposes, effective August 6. On October 1, the established date for reviewing the loan rate, the maximum was raised to 10 percent. It remains there until the next review date, April 1, 1975.

AGRICULTURAL PRODUCTS CO-OPERATIVE MARKETING ACT

(Quebec Maple Syrup Marketing Agreements)

Four amendments to Section 3 of the Act established agreements between the Federal Government and the maple producers' syndicates of Megantic, Frontenac, Dorchester and Beauce Counties in the Province of Quebec. Initial payments to primary producers were set at 40 cents a pound of syrup for Fancy AA, 36 for Light A, 32 for Medium B, 28 for Amber C, and 25 for Dark D.

With the exception of the Megantic agreement, the maximum allowance for costs of processing, handling and selling were set at $7^1/_2$ cents a pound of syrup. In the case of Megantic it was $9^1/_4$ cents.

These agreements, like those covering other commodities, enable the producing organization to secure a guaranteed loan from a bank.

BILLS BEFORE PARLIAMENT

As this publication went to press, these Bills had received first or second reading, or were before the House Committee on Agriculture:

TWO-PRICE WHEAT ACT (Bill C-19)

The two-price wheat system has been in effect since autumn, 1973. The Bill now before the House extends its effectiveness until July 31, 1980. (A similar Bill was introduced on May 3, 1974, but was shelved when Parliament was dissolved. The present Bill was introduced on October 9.)

Designed basically to keep down the price of bread, the program establishes guaranteed floor prices to producers of \$3.25 for ordinary wheat and \$5.75 for durum. The purpose is to protect the consumer against high world price levels while giving farmers the benefits of these higher prices. When the world price goes above \$3.25 a bushel, the Canadian price to the producer will be at a similar level, with the government paying the difference to producers up to a maximum of \$5.00. For durum, the maximum, with subsidy, is \$7.50.

PRAIRIE GRAIN ADVANCE PAYMENTS ACT (Bill C-10)

This amendment, when it becomes law, would increase the maximum cash advance from \$6,000 to \$15,000. The second reading was November 19. It has been referred to the Standing Committee on Agriculture.

FARM CREDIT ACT (Bill C-34)

The first reading was November 1, 1974. This amendment would increase the capital of the Farm Credit Corporation from \$66 million to \$100 million, increasing the amount that the Corporation may borrow from the Minister of Finance from \$1.65 billion to \$2.5 billion.

The loan ceiling for persons under 35 would be raised from \$100,000 to \$150,000. Loans to such people could exceed 90 percent of the appraised value of farm land and chattels, under conditions to be determined by regulation. Amendments would allow loans to be secured by mortgages other than first mortgages, as required by present legislation.

A Part 4 will be added to the Act, entitled "Loans to Establish Young Farmers". Those under 35 will be given the opportunity to phase into farming over a five-year period, using income from a non-farm occupation to help develop an effective farm unit.

ACT TO AMEND THE CANADIAN WHEAT BOARD ACT (Bill S-6)

The first reading was October 1. This amendment to the Wheat Board Act, if passed, will allow the Board to postpone final payments until January 1, or after, following the crop year for which payments are to be made. It is designed to give farmers a time for final payments that enables them to lighten their tax burden. (During the crop year '73-'74, receipts on more than 253 million bushels of wheat, oats and barley were deferred.)

WESTERN GRAIN STABILIZATION ACT (Bill C-41)

Under the Minister responsible for the Canadian Wheat Board, this proposed legislation is designed to stabilize grain income on the Prairies. It would protect producers against such factors as drops in price, market slumps, and crop failures. The Bill received first reading on December 4.

The plan would create a fund made up of contributions by the producer and the Federal Government to maintain the net cash flow to Prairie grain producers from grain sales, at the level of the average for the previous five years. When the eligible net cash flow to producers falls below this average, payments would be made directly to producers in proportion to their contributions. All present producers are to be participants. However, they may choose to opt out anytime before January 1978. New producers must participate.

PUBLICATIONS

Readers: in ordering publications, please use the addresses as shown.

ECONOMICS BRANCH PUBLICATIONS

Available from the Economics Communications Unit, Agriculture Canada, Ottawa, K1A 0C5.

National and Regional Hog Supply Functions. S.B. Chin, J.L. Pando and D.A. West. Pub. No. 74/15.

A 1971 Study of Industrial Milk Farms in Quebec and Ontario. Working paper. Henri-Paul Blanchard. Pub. No. 74/4.

Seasonal, Cyclical and Trend Variations in the Hog Industry. Summary. T.M. Petrie. Pub. No. 74/20.

Federal Agricultural Legislation, up to 1975. Pub. No. 75/1.

A Bibliography of Canadian Agricultural Economics Papers. J. Mercier and A. Trempe. December, 1974.

AGRICULTURE CANADA PUBLICATIONS

Dairy Produce Market Report, weekly. Bilingual. Vol. 49, No. 44, week ending November 2, 1974. Free. Cat. No. A-77-7/49-44. Available from Information Division, Agriculture Canada.

Grain Elevators in Canada for Crop Year 1974/75. As at August 1, 1974, including licensed grain dealers. Ottawa, 1974. 156 p. Tables. 24 cm. Processed. Loose leaf with paper cover and ring binder. Compiled by Canadian Grain Commission, Winnipeg, Manitoba. $2.50 per copy. Cat. No. A92-6/1975. Available from Information Canada.

The Lighter. Quarterly 23 cm. Paper cover. Partly bilingual. Vol. 44, No. 4, Fall, 1974. 46 p. Free. Cat. No. A27-10/44-4. Available from Information Division, Agriculture Canada.

STATISTICS CANADA PUBLICATIONS

Available from the Publications Distribution Unit, Statistics Canada, Ottawa, K1A 0T7.

Fruit and Vegetable Preservation: Pack of Processed Peas 1974. Vol. 3, No. 17, November, 1974. Bilingual (Service Bulletin). $1.40 per year. Cat. No. CS32-023.

Production of Eggs and Poultry. Vol. 27, No. 9, September, 1974. Bilingual. 30¢ per copy. $3 per year. Cat. No. CS23-003.

Fluid Milk Sales. Vol. 28, No. 8. August, 1974. Bilingual. $1.50 per year. Cat. No. CS23-003.

Selected Dairy By-Products. Production and inventory of process cheese. Vol. 3, No. 18, September, 1974. Bilingual (Service Bulletin). $1.40 per year. CS32-024.

Farm Wages in Canada. August 1974. Bilingual. $1.05 per year. Cat. No. CS21-002.

Fruit and Vegetable Crop Reports, 1974. No. 7. Third forecast of the commercial production of all fruits, 1974. Published November, 1974. Bilingual. $1.40 per series. Cat. No. CS22-003.

Wheat review. Vol. 45, No. 3, October, 1974. Bilingual. $4 per year. Cat. No. CS 22-005.

Farm Input Price Index, Third Quarter, 1974. Bilingual. 35¢ per copy. $1.40 per year. Cat. No. CS62-004.

Grain Milking Statistics. August, 1974. Bilingual. 30¢ per copy. $3 per year. Cat. No. CS 32-003.

Livestock and Animal Products Statistics, 1973. Ottawa, 1974. 88p. Tables, charts, 28cm. Paper cover. Bilingual. Prepared in the Livestock and Animal Products Section, Agriculture Division. $1.40 per copy. Cat. No. CS23-203.

Stocks of Dairy and Frozen Poultry Products. Vol. 57, No. 10, Ocotober, 1974. Bilingual. 30¢ per copy. Cat. No. CS32-009.

Standing Committee on Agriculture. 1st session, 30th parliament, 23 Elizabeth II, 1974. Chariman, Mr. Walter Smith. Bilingual. Minutes or proceedings and evidence respecting. Main Estimates 1974/75. No. 3, Tuesday, October 22, 1974. 28p. Appearing: The Hon. Eugene Whelan, Minister of Agriculture. Witness. From the Department of Agriculture: Mr. S.B. Williams, Deputy Minister. Including the 1st report of the House. 35¢ per copy. Cat. No. XC12-301/1-3.

Farm Implement and Equipment Sales. Vol. 16, No. 8, January 1st to August 31, 1974. Bilingual. $1.50 per year. Cat. No. CS63-009.

Tobacco and Tobacco Products. Production and disposition of tobacco products. Vol. 3, No. 12, September, 1974. Bilingual. (Service Bulletin). $1.40 per year. Cat. No. CS32-022.

Stocks of Fruit and Vegetables. Vol. 38, No. 10, October 1st, 1974. Bilingual. 30¢ per copy. $3 per year. Cat. No. CS32-010.

Farm Cash Receipts. Vol. 35, No. 8. August, 1974. Bilingual. 30¢ per copy. $3 per year. Cat. No. CS21-001.

Dairy Review. Vol. 35, No. 9, September, 1974. Bilingual. 40¢ per copy. $4 per year. Cat. No. CS23-001.

Statistics Canada Daily. November 19, 1974. (Also French). 10¢ per copy. $25 per year. Cat. No. CS11-001.

Dairy Factory Production. Vol. 43, No. 9, September, 1974. Bilingual. $1.50 per year. Cat. No. CS32-002.

Survey of Production, 1972. Ottawa, 1974. Vol. 51, 35p. Tables, charts. 28cm. Paper cover. Bilingual. Prepared in the Industrial Output Section, Industry Product Division. $1.05 per copy. Cat. No. CS61-202-1972.

PARLIAMENTARY PUBLICATIONS

Available from Information Canada, 171 Slater Street, Ottawa, K1A 0S9.

Bills of the House of Commons. 1st session, 30th parliament, 23 Elizabeth II, 1974. Bilingual. XB-301. $10 (subscription). C-28. Animal disease and protection Act. (An Act to amend the Animal Contagious Diseases Act). First reading, October 21, 1974. (The Minister of Agriculture). 21 p. 35¢ per copy. Cat. No. XB301-28/1.

Standing Committee on Agriculture. 1st session, 30th parliament, 23 Elizabeth II, 1974. Deputy Chairman: The Honourable Hervé J. Michaud. First proceedings on Bill S-10, entitled: An Act to amend the Feeds Act. No. 2, Tuesday, November 5, 1974. 12p. 20¢ per copy. Cat. No. YC25-301/1-2.

Second Proceedings on Bill S-10. Entitled: An Act to amend the Feeds Act. No. 3, Thursday, November 7, 1974. 12p. 20¢ per copy. Cat No. YC25-301/1-3.

Special Committee on Egg Marketing. 1st session, 30th parliament, 23 Elizabeth II, 1974. Chairman: Mr. Francis Fox. Minutes of proceedings and evidence respecting: Order of Reference. No. 7, Thursday, November 7, 1974. 104p. $1.10 per copy. Cat. No. XC2-301/1-7.

Special Committee on Egg Marketing. 1st session, 30th parliament, 23 Elizabeth II, 1974. Chairman: Mr. Francis Fox. Minutes of proceedings and evidence respecting: Order of Reference. No. 7, Thursday, November 7, 1774. 104p. $1.10 per copy. Cat. No. XC36-301/1-7.

Standing Committee on Labour, Manpower and Immigration. 1st session, 30th parliament, 23 Elizabeth II, 1974. Chairman: Mr. Peter Stollery. Bilingual. Minutes of proceedings and evidence respecting Organization and Bill C-12, an Act to provide for the resumption of grain handling operations on the west coast of Canada. No. 1, Monday, October 7 and Wednesday, October 9, 1974. 39p. Appearing: The Honourable John Munro, Minister of Labour. 50¢ per copy. Cat. No. XC36-301/1-1.

Standing Committee on Labour, Manpower and Immigration. 1st session, 30th parliament, 23 Elizabeth II, 1974. Chariman: Mr. Peter Stollery. Bilingual. Minutes of proceedings and evidence respecting: Bill C-12, an Act to provide for the resumption of grain handling operations on the west coast of Canada. No. 2, Wednesday, October 9, 1974. 38p. Appearing: The Honourable John Munro, Minister of Labour. Witness: From the Department of Labour: Mr. W.P. Kelley, Assistant Deputy Minister, Industrial Relations. Including the 1st report to the House. 50¢ per copy. Cat. No. XC36-301/1-2.

West Coast Grain Handling Operations Act, 1974. C-12. An Act to provide for the resumption of grain handling operations on the west coast of Canada. As passed, October 10, 1974. 5p. 15¢ per copy. Cat. No. XB301-12/3.

C-21. An Act to amend the Agricultural Products Cooperative Marketing Act. First reading, October 10, 1974. (The Minister of Agriculture.) 1p. 15¢ per copy. Cat. No. XB301-21/1.

Standing Committee on Agriculture. 1st session, 30th parliament, 23 Elizabeth II, 1974. Chairman: Mr. Walter Smith. Bilingual. Minutes of proceedings and evidence respecting. Organization and Main Estimates 1974/75. Department of Agriculture. No. 1, Tuesday, October 8 and Tuesday, October 15, 1974. 34p. Appearing: The Honourable Eugene Whelan, Minister of Agriculture. Witnesses: From the Dpartment of Agriculture: Mr. S.B. Williams, Deputy Minister. 50¢ per copy. Cat. No. XC12-301/1-1.

Minutes of Proceedings and Evidence Respecting. Main Estimates 1974/75. Canadian Wheat Board. No. 2, Thursday, October 17, 1974. 23p. Appearing: The Honourable Otto Laing, Minister responsible for the

Canadian Wheat Board. 35¢ per copy. Cat. No. XC12-301/1-2.

C-278. An Act to Amend the Veterans' Land Act. First reading, October 15, 1974. (Mr. Marshall.) 1p. 15¢ per copy. Cat. No. XB301-278/1.

C-327. An Act to Amend the Farmers' Creditors Arrangement Act. First reading, October 15, 1974. (Mr. Baldwin.) 2p. 15¢ per copy. Cat. No. XB301-327/1.

C-313. An Act to Amend the Farm Products Marketing Agencies Act. First reading, October 15, 1974. (Mr. Francis.) 1p. 15¢ per copy. Cat. No. XB301-314/1.

C-34. Farm Credit Act, an Act to Amend. First reading, November 1, 1974. (The Minister of Agriculture.) 11p. 25¢ per copy. Cat. No. XB301-34/1.

C-30. An Act to repeal the Prairie Farm Assistance Act. First reading. October 23, 1974. (The Minister of Agriculture.) 1p. 15¢ per copy. Cat. No. XB301-30/1.

Standing Committee on Agriculture. 1st session, 30th parliament, 23 Elizabeth II, 1974. Chairman: The Honorable Hazen Argue. First proceedings on Bill S-6, entitled: An Act to amend the Canadian Wheat Board Act. No. 1, Thursday, October 31, 1974. 13p. 20¢ per copy. Cat. No. YC25-301/1-1.

Standing Committee on Agriculture. 2nd session, 29th parliament, 23 Elizabeth II, 1974. Chairman: The Honorable Hazen Argue. Index of proceedings, issue Nos. 1 to 9 inclusive. 9p. 20¢ per copy. Cat. No. YC25-292/1-10.

IN REPLY

Readers' comments on specific articles in recent issues of this magazine are always welcome. The more specific they are, the more help they give the authors and editors.

Here are some comments on articles in the April and August issues:

Morris Hevne, a farmer of Millet, Alberta, writing about the August issue, said he hoped that the articles in it "are a review of actual conditions at the time in any particular enterprise. Emphasis should be based on the situation that exists within our borders, but we must be conscious of what is happening on the world scene in that industrial enterprise".

Guy L. Kerr, District Agriculturist, Rimbey, Alberta, found the August article on "Economics of Forage Production and Use on Grain-Cattle Farms" gave him more ideas on how to assess what an individual should be doing. Some articles he found were relevant and/or interesting.

R. Butler, a professor at Western College of Veterinary Medicine at the University of Saskatchewan, Saskatoon, found the August "Economic Analysis of Grain-Beef Cattle Farms in the Lloydminster area of Saskatchewan" "useful information in an area of particular interest."

An agronomist with the Quebec Ministry of Agriculture, M. Pierre Ferron of Cap-de-la-Madeleine, responded to the article on "Ontario Grain-Corn Marketing": "Because of recent developments in my area, I am interested in the problems raised, and the solutions outlined will be most useful in my work as a counsellor in management and economics."

Pierre Gelinas, a sales manager with Hydro Quebec at Rimouski, found all the articles interesting for the agricultural extension worker. "Economic factors," he explained, "most variable in a time of inflation, must be specially considered in every project study." He congratulated the authors for their presentation of tables in the publication.

CORRECTION

Volume 9, Number 4, August 1974

Page 38, column 2, line 5 – $232 million, rather than $323 million.

IN REPLY TO AUTHORS AND EDITORS REGARDING DECEMBER 74
CANADIAN FARM ECONOMICS

I have read the following article(s):

(1) A comparison of the Dairy Industries in Canada and the United States
(2) A computer Model for Ration Formulation and Selection of a Feeding Program for Cattle
(3) Farm and Off-Farm Incomes of Farm Families in Canada
(4) Combine Sizes for Least-Cost Cereal Harvesting

My comments are on article number ______ .

	not useful								very useful
This article was:	1	2	3	4	5	6	7	8	9	10

Because (e.g., The most important economic and social factors were studied. The work was well documented and the conclusions were useful to me).

Beefs Bouquets (Suggestions to authors, publications committee and editors)

My comments may ( ) may not ( ) be used in a future issue of this publication if the editor wishes.

NAME (Please print) . . . . Occupation . . . .

ADDRESS . . . .

Please place this sheet in an envelope and address it to:

IN REPLY,
Att: John McConnell,
Economics Branch,
C.D.A., Sir John Carling Building,
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VOLUME 10 NUMBER 1 FEBRUARY 1975

CANADIAN FARM ECONOMICS

Agriculture Canada

HON. EUGENE WHELAN, MINISTER – S.B. WILLIAMS, DEPUTY MINISTER

Canadian Farm Economics is published bi-monthly by the Economics Branch, Canada Department of Agriculture, Sir John Carling Building, Ottawa, and is based on material prepared by economists of the Economics Branch.

Purpose: To provide current information on agricultural economics for economists, representatives of extension, education, press, agri-business, trade, foreign offices, bio-physical and social science researchers, administrators, librarians and leading farmers.

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Letters from readers: Letters are encouraged and should be addressed to the author or the Managing Editor. Responses . . . comments, suggestions and points of view are important for effective two-way communications. Letters may be used in the following issue of CFE and will be edited prior to publication where necessary.

INPUT SUBSTITUTION AND PRODUCTIVITY OF CANADIAN AGRICULTURE, 1961 TO 1973

Agricultural productivity has increased only slightly since 1962. This has been a result of inputs increasing at a rate of 1.2 percent annually, while output increased only 1.5 percent a year.

The rather large decrease of 3 percent a year in the labor input has necessitated large investments in labor intensive buildings, machinery and other capital inputs in order to maintain and increase output.

*D.M. Shute**

INTRODUCTION

Canadian economic activity is strongly motivated by a desire to obtain as high a level of material well-being as possible with a minimum expenditure of resources. Any advance in productivity or "output per unit of input" is consistent with this goal and can be deemed progress.

The productivity of Canadian agriculture (output per unit of input)[1] has increased since 1961 at the rate of 1.2 percent a year. However, it should be noted that in 1961 output of grains from the Prairie region, which has a significant effect on the total output index, was seriously reduced as a result of drought. Total Canadian farm output in 1961 was considerably less than in 1962. Thus, much of the gain in output in the period 1961 to 1973 was due to the 28-percent increase from 1961 to 1962. Since 1962, agricultural productivity has increased at the rate of .3 percent a year. This has been a result of farm output increasing at the annual rate of 1.5 percent between 1962 and 1973, while production inputs were rising 1.2 percent annually (Table 1, Figure 1).

In 1973, total agricultural output was 23 percent higher than in 1962. Most of the increased output was due to

TABLE 1. INDEXES OF FARM OUTPUT, PRODUCTION INPUTS, AND PRODUCTIVITY (OUTPUT PER UNIT OF INPUT), IN CANADA, 1961 TO 1973 (1961=100)

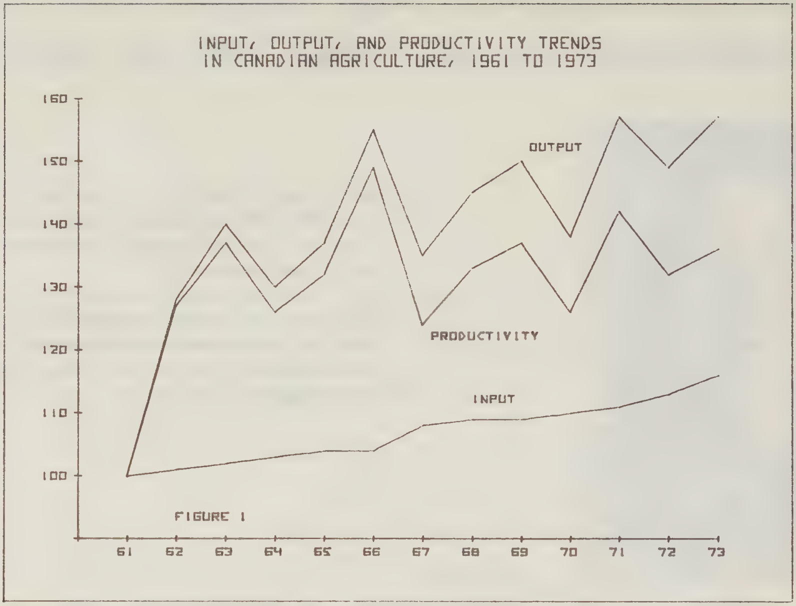
Year	Farm Output	Production Inputs	Productivity
1961	100	100	100
1962	128	101	127
1963	140	102	137
1964	130	103	126
1965	137	104	132
1966	155	104	149
1967	135	108	124
1968	145	109	133
1969	150	109	137
1970	138	110	126
1971	157	111	142
1972	149	113	132
1973	157	116	136
Annual Growth Rate[1]			
1961 to 1973	2.36	1.15	1.20
1962 to 1973	1.48	1.17	.31

[1] All growth rates were calculated by fitting an exponential trend line to the index numbers using the least squares method and then using the compound interest formula.

Source: Based on Statistics Canada data.

*Deirdre Shute is an economist with the Marketing and Trade Division, Economics Branch, Agriculture Canada, Ottawa.

[1] The indexes for Canada of output and inputs as reported in this paper are aggregations, by provinces, of the price deflated output and inputs; e.g., they are indexes of volume.



increased production of livestock and livestock products. Thus, while grain production increased about 15 percent, livestock output had increased by 36 percent and poultry output was nearly 83 percent higher in 1973 than it was in 1962.

While total agricultural output increased about 23 percent between 1962 and 1973, production inputs increased about 15 percent. However, the distribution of the various inputs in the total input mix changed significantly. By 1973, inputs in the form of machinery, purchased feed and seed, and commercial fertilizer and pesticides had increased greatly; the relative proportion accounted for by labor had decreased, while real estate remained almost unchanged as a share of total inputs. Farm family labor and equity capital input were decreasing, while purchased inputs were increasing. Purchased inputs in 1973 represented 54 percent of all inputs used in agricultural production compared with 42 percent in 1961. Increased accessibility to agricultural credit has helped farmers to make this transition.

Many farmers, unable to take advantage of technical innovations in agriculture for a variety of reasons or who were on marginal land, dropped out of farming. The number of census farms in 1961 was 480,900. In 1971, this figure had decreased nearly 24 percent to 366,000. While the number of census farms dropped nearly 24 percent, the total area of all census farms declined only 1.7 percent. Extensive use of labor and time-saving inputs now enabled fewer farm operators to utilize additional land, some obtained from farmers that had left farming and some by improving available land. Improved land increased approximately 5 percent between 1961 and 1971 while unimproved land decreased by about 11 percent. The total number of acres per census farm increased to 464 in 1971 from 359 acres in 1961. The number of census farms of less than 800 acres per farm decreased approximately 29 percent between 1961 and 1971, while farms of 800 acres or more increased by about 21 percent.

Most of these changes were associated with, and partly resulted from, changes in the quality and composition of the production inputs. Some of these changes will be discussed briefly in the following sections.

CHANGES IN THE INPUT MIX

Total real estate inputs in Canadian agriculture, which include investment, depreciation and repairs on buildings and property taxes for both owned and rented real estate, have increased approximately 19 percent since 1961, or 1.6 percent a year (Table 2). Their relative importance in the input mix over the time period studied, though, has remained at about 28 percent (Table 3). Building and fencing repairs contributed the

TABLE 2. INDEXES OF PRODUCTION INPUTS BY MAJOR CATEGORIES, CANADIAN AGRICULTURE, 1961 TO 1973 (1961=100)

			CAPITAL							
Year	Labor[1]	Real Estate[2]	Machinery & Equip.[3]	Livestock[4]	Purchased Feed	Purchased Seed and Nursery Stock	Fertilizer and Lime	Miscel-laneous[5]	Total Capital	Total Inputs
1961	100	100	100	100	100	100	100	100	100	100
1962	97	101	102	98	114	88	111	104	104	101
1963	95	100	105	106	127	91	123	107	110	102
1964	92	100	109	112	131	97	149	111	115	103
1965	87	100	115	105	142	109	168	116	121	104
1966	80	102	120	106	148	114	205	126	129	104
1967	82	104	124	111	158	117	235	134	136	108
1968	80	107	126	106	156	121	256	135	138	109
1969	78	107	128	114	178	149	202	127	140	109
1970	75	114	126	121	159	309	178	131	138	110
1971	75	115	128	118	164	316	204	129	140	111
1972	70	117	132	126	181	322	212	134	148	113
1973	68	119	143	133	179	334	236	144	156	116
Annual Growth Rates[6] 1961 to 1973	−3.05	1.61	2.74	2.12	4.44	13.39	6.53	2.77	3.52	1.15

[1] Total farm labor force (farm operators, unpaid family labor and hired labor).

[2] Includes interest on investment, depreciation and repairs on buildings, and property taxes for both owned and rented real estate.

[3] Includes fuel and other purchased items associated with machinery operation plus interest on investment and depreciation.

[4] Includes interest on investment in livestock and purchased livestock.

[5] Includes electric power, pesticides, and other purchased inputs.

[6] All growth rates over the period1961 to 1973 were calculated by fitting an exponential trend line to the index numbers using the least squares method and then using the compound interest formula.

Source: Based on Statistics Canada data.

TABLE 3. PERCENTAGE DISTRIBUTION OF PRODUCTION INPUTS, CANADIAN AGRICULTURE, 1961 TO 1973 (VALUED AT 1961 PRICES)

			CAPITAL						
	Real Estate	Labor	Machinery	Livestock	Feed	Seed & Nursery Stock	Fertilizer	Misc.	Total Capital
	percent of total inputs								
1961	27.7	34.6	20.2	3.6	6.5	.6	2.0	4.8	37.7
1962	27.7	33.3	20.4	3.5	7.4	.6	2.2	4.9	39.0
1963	27.2	32.1	20.9	3.7	8.1	.6	2.4	5.0	40.7
1964	26.8	30.9	21.5	3.9	8.2	.6	2.9	5.2	42.3
1965	26.8	29.0	22.4	3.6	8.9	.7	3.2	5.4	44.2
1966	27.0	26.5	23.2	3.7	9.2	.7	3.9	5.8	46.5
1967	26.7	26.1	23.1	3.7	9.5	.7	4.3	5.9	47.2
1968	27.1	25.3	23.4	3.5	9.3	.7	4.7	5.9	47.6
1969	27.0	24.8	23.7	3.7	10.6	.9	3.7	5.6	48.2
1970	28.8	23.6	23.4	4.0	9.4	1.8	3.2	5.7	47.6
1971	28.8	23.3	23.4	3.8	9.6	1.8	3.7	5.6	47.9
1972	28.6	21.6	23.8	4.0	10.4	1.8	3.8	5.7	49.6
1973	28.4	20.5	25.0	4.1	10.0	1.9	4.1	6.0	51.1

Source: Based on Statistics Canada data.

TABLE 4. INDEXES OF FARM INPUT PRICES, CANADA, ANNUAL AVERAGES 1961 TO 1973 AND THIRD QUARTERS, 1973 AND 1974.

Year	Hired Farm Labor	Land & Farm Bldgs.	Farm Machinery & Motor Vehicles	Feeder Cattle	Seed	Prepared Feed	Fertilizer	Small Tool & Supplies	Electricity	All Farm Inputs
1961	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1962	101.9	111.7	101.4	111.6	110.9	106.0	97.6	98.9	99.8	105.2
1963	105.3	119.6	103.4	109.8	112.2	107.5	102.6	109.6	98.7	108.0
1964	109.5	118.4	106.0	98.2	114.6	106.4	102.6	118.0	98.1	108.6
1965	118.5	127.4	107.6	98.4	116.0	107.8	102.8	112.6	98.1	112.0
1966	131.8	138.9	111.1	118.4	117.0	112.6	100.9	108.2	98.0	118.6
1967	142.6	135.0	114.8	124.6	115.2	115.5	102.1	110.8	99.9	121.5
1968	153.0	140.4	118.8	124.0	120.2	113.5	105.2	112.2	102.6	124.9
1969	161.8	151.4	121.8	145.3	120.1	110.2	98.9	116.1	107.4	129.1
1970	169.8	150.0	124.8	155.6	116.4	111.8	96.4	119.0	109.9	131.2
1971	178.2	158.1	128.8	158.0	115.7	113.2	99.6	122.8	113.9	135.9
1972	190.6	176.1	132.6	180.2	111.9	114.0	103.0	132.3	114.1	143.3
1973	216.1	190.7	137.7	236.9	147.6	173.7	115.5	162.3	122.1	166.7
Third Quarters										
1973	222.7	191.9	138.3	258.2	147.9	201.5	114.9	161.0	123.0	173.3
1974	260.4	206.0	157.3	187.3	268.9	204.1	170.4	256.4	130.4	195.2
Growth Rates										
1961 to 1973	6.78	4.68	2.75	6.36	1.47	2.27	.43	2.75	1.66	3.60

Source: Statistics Canada, Farm Input Price Index, Cat. No. 62-004.

most to increased real estate inputs, increasing 48 percent in total since 1961. Average output per unit of real estate input has remained relatively constant since 1961 as a result of combining more and improved inputs on the available land.

Labor employed in Canadian agriculture has decreased since 1961 at the rate of 3.1 percent annually. More or less simultaneous with the movement of labor out of agriculture has been the adoption of such labor-saving capital inputs as machinery, fertilizer, pesticides and improved seeds. Consistent with these resource substitutions and acting as a catalyst have been changes in their relative prices. As the cost of labor increases relative to the cost of machinery and other inputs, as it has done since 1961, there is an economic incentive to substitute labor extensive inputs for labor intensive inputs, (Table 4). Although the total labor input in agriculture has decreased nearly 32 percent since 1961, total output per unit of labor input has risen by about 5.6 percent a year. In terms of relative importance in the input mix, though, labor has become less important. In 1961, labor comprised about 35 percent of total inputs. By 1973, this had dropped to about 20 percent, (Table 3).

Capital inputs[2] in 1973 were about 56 percent more than in 1961. The rate of increase since 1961 has been 3.5 percent annually, slightly more than the rate at which labor inputs were declining. The percentage contribution of capital to total inputs has increased from 38 percent in 1961 to 51 percent in 1973, (Table 3).

Inputs in the form of farm machinery and equipment, and associated fuel, repairs and depreciation inputs, alone have increased nearly 43 percent since 1961. This reflects a growth rate of 2.7 percent between the years 1961 and 1973. The interest on the investment and depreciation portion of total machinery and equipment inputs increased nearly 30 percent since 1961, but the largest increase occurred in the machinery repairs portion. In 1973, machinery repairs were up about 115 percent from 1961.

Inputs in the form of purchased livestock, feed and seed have all increased considerably since 1961. With ever increasing specialization and improved means of transportation, this particular group of inputs has been increasing rapidly. Purchased seed inputs alone had increased more than 200 percent by 1973 and, at 13 percent, reflected the highest annual growth rate of any capital input. Purchased feed in 1973 was up almost 80 percent from 1961 with a growth rate of 4.4 percent annually, while livestock inputs rose by about 33 percent and displayed a growth rate of 2.1 percent annually. Growth in this input group, purchased live-

[2] All inputs other than labor and real estate.

stock, feed and seed, represents an important means of accelerating the adoption of technological improvements by reducing long-term capital investments needs. A convenient package of improved technology is present in such forms as better feed mixtures, improved seed stock and superior livestock. Technology of this type has contributed greatly to the efficiency of production because of the improved quality of the input and because it is readily adaptable on a large scale.

Fertilizer and lime inputs increased about 136 percent between 1961 and 1973. The rate of expansion in fertilizer and lime usage was 6.5 percent a year. Its relative importance in the total input mix had doubled by 1973.

The usage of farm inputs designated "miscellaneous inputs" has also increased significantly since 1961. Between 1961 and 1973 this category increased about 2.7 percent annually. The most significant increases were in the usage of pesticides and electric power. Pesticides during the time period studied increased at an annual rate of 7.7 percent.

PURCHASED VERSUS NON-PURCHASED INPUTS

As farms become larger and the production process more complex, it becomes necessary for farmers to be more specialized if they are to use, economically, the latest techniques and be able to compete effectively with others. Increased farm size and specialization are both associated with increased productivity. They are also associated with an increasing trend away from farm produced inputs and towards purchased or inputs supplied from the non-farm sector. The portion of feed, seed, livestock and miscellaneous inputs that is made up of transportation charges, processing costs, marketing fees and quality changes has been steadily increasing. In 1961, non-purchased inputs comprised about 58 percent of total inputs while purchased inputs comprised about 42 percent. By 1973, the share of non-purchased inputs had decreased at the rate of .6 percent annually to 46 percent and purchased inputs, increasing at a rate of 3.2 percent annually, comprised about 54 percent of total inputs.

SUMMARY AND CONCLUSIONS

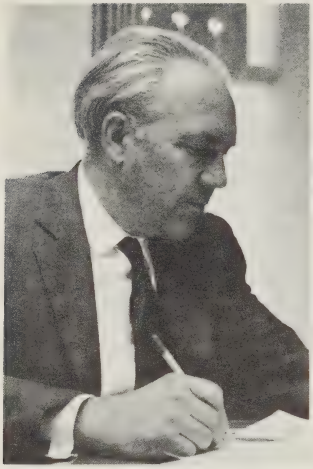
Agricultural productivity, that is output per unit of input, has increased only slightly since 1962. This has been a result of inputs increasing at a rate of 1.2 percent annually, while output increased only 1.5 percent annually. Cattle, hog and poultry output increased at annual rates of 2.6, 4.2 and 5.5 percent, respectively, but grain output had a negative growth rate of .4 percent.

Grain output was down in 1961 due to severe drought conditions and again in 1970 in response to the LIFT program. Because of the significant contribution of grain production to total Canadian agricultural output, these two years of reduced grain production were enough to decrease the rate of total output growth to 1.5 percent annually since 1962.

Although the input mix, size and structure of farm operations has changed significantly since 1962, total agricultural output has not. The rather large decrease of 3 percent a year in the labor input has necessitated large investments in labor intensive buildings, machinery and other capital inputs in order to maintain and increase output. The long-term effect of these investments on output and how increased purchased inputs will be financed in the future remains to be seen.

Some of the major input groups briefly touched on in this paper will be discussed in greater detail in the following papers.

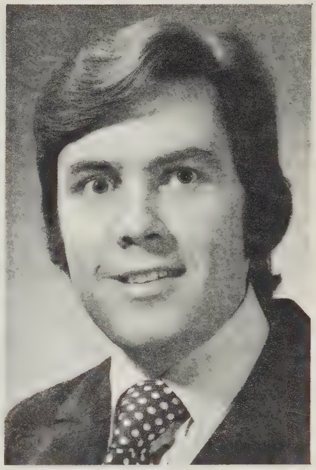
AGRICULTURAL MANPOWER



The long-term annual 3-percent rate of decline in the agricultural labor force came to a halt in 1974 and may have been caused by encouraging agricultural conditions and significantly increased farm wage rates.

A slight decrease in agricultural manpower is currently expected in 1975, but any major change in the economic climate of the non-agricultural sectors could alter this situation.

*R.S. Rust and P.M. Stone**



SITUATION SUMMARY

The long-term trend for total agricultural employment in Canada has been downward. During 1974, agricultural employment diverged from the secular trend and registered an increase of 1.3 percent when compared with agricultural employment for 1973. Concomitant with the increase in total agricultural employment there was a substantial advance in money wage rates for paid employees. To offset the long-term reduction in the labor force and the possible adverse impact that a reduction in the labor force might have upon agricultural output, farmers have continued to substitute capital, especially machinery, for labor. The annual growth in output per man hour between 1961-72 was higher in agriculture than in any other sector of the economy. Statistical analysis of the relevant data indicated that the long-term annual rate of decline in the agricultural labor force has been approximately 3 percent, with increases in the rate above the long-term trend in the more recent time period. To resolve a disequilibrium situation in the agricultural labor market, initiatives were taken by the Federal Government in cooperation with the provinces to introduce the Canada Farm Labour Pool program across Canada; to attract students and youth to employment on farms; to stimulate the mobility of the Canadian work force and to improve seasonal worker living conditions on farms. The Federal Government also expanded the non-immigrant worker movements to meet manpower needs in the absence of Canadian workers.

SITUATION

The current agricultural manpower situation results from a combination of factors. Perhaps the most important influence has been the rural-urban migration pattern in the post Second World War period. The farm population, as reported by the Census of Canada, declined 49 percent between 1951 and 1971 (67,500 per year). The reduction in the farm population between 1961 and 1971 was 36.5 percent (82,000 per annum) and between 1966-71, it was 26 percent (99,000 per annum). The faster annual rate of decline in the farm population during the latter part of the time period results in part from the adverse economic conditions for agriculture which prevailed in the 1969-71 years. There was also a decline in the rural non-farm population during the same time span (1961 to 1971), further aggravating the agricultural manpower supply situation.

Not all of the decline in the farm labor force, however, can be attributed to rural-urban migration. Canadian agriculture has been going through a period of resource adjustment. The resource adjustment that occurred took the form of farm consolidation and improvements, farm

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mechanization with the associated capital for labor substitution, and the adoption of new technology. Faced with the resource adjustment problem and given the prices of commodities and price relatives which persisted, farmers as a group were faced with limited alternatives regarding manpower. Firstly, they could leave the industry if an income opportunity better than farming could be found, or secondly, they could release hired or family help and adopt labor-saving technology. Both these situations provided benefits to the Canadian economy: (1) when farmers retired from agriculture some of the land which became available was directed towards farm consolidation and the development of larger farm units; and (2) the farm workers who left agriculture, especially the family workers, were available to meet the growing demand for labor by other sectors of the Canadian economy.

Farm industry spokesmen indicated, during 1973 and early in 1974, that faced with both a decline in the farm and rural non-farm population, farmers were finding it increasingly difficult to obtain farm workers. The problems essentially were a decreased supply of farm workers resulting from the combination of long hours of hard manual labor for relatively low wages, when compared with the non-agricultural sector; a lack of legislation covering agricultural employment; and poor housing facilities in remote rural areas invariably cut off from the generally accepted social services (schools, hospitals, commercial centers, entertainment, etc.) which society has come to accept as essential to their general welfare. With the increased demands by non-agricultural, urban-based industries for hired labor, often at preferential wage rates when compared to agriculture and when non-pecuniary aspects were taken into consideration, the potential supply of labor to the agricultural sector continued to decline under these restraints.

In response to what was developing into a major crisis situation, governments and farm organizations, following a series of meetings in early 1974, discussed methods to rectify the apparent disequilibrium that had developed in the agricultural labor market. Despite a lack of empirical evidence, the problem appears to have been a supply shortage for both skilled and unskilled, permanent and seasonal farm labor because of the unattractiveness of farm employment.

In the light of the described situation, the Federal Government, through the Department of Manpower and Immigration, took a number of initiatives to improve the supply of seasonal and full-time farm labor. Specifically, the past year saw the introduction of the Canada Farm Labour Pool (CFLP) program, designed to assist farmers in finding both seasonal and full-time employees. An agreement was signed between Canada and Mexico along similar lines to the Caribbean program and a considerable expansion occurred in the Caribbean worker program. Contributions for the Federal-Provincial cost sharing incentive programs to mobilize the available Canadian work force and to stimulate improvements in housing for seasonal farm workers more than doubled in 1974.

AGRICULTURAL EMPLOYMENT AND PRODUCTIVITY

The Canadian economy has continued to expand during the past year requiring a simultaneous growth in the labor force. Participation rates of those eligible to be included in the labor force demonstrate different patterns between the different social strata. In 1971, the total participation rate of persons more than 15 years of age was 58 percent, compared with 54 percent in 1961. In those areas classed as urban in 1971, the participation rate was 59 percent, compared with a 64-percent participation rate in rural-farm areas. A closer examination reveals that the male participation rate in urban areas was 77 percent, compared with an 83 percent rate for the male rural-farm labor force; the comparable female data were 42 percent and 41 percent for urban and rural-farm, respectively, in 1971. These data suggest that, while there was greater participation in the work force in the 1970's on the part of male rural-farm workers, compared with the early 1960's, the same conclusion cannot be drawn for female workers.

On a seasonally adjusted basis the total unemployment rate varied between 4.9 percent and 5.8 percent during the first three quarters of 1974. The lowest unemployment rates were recorded in the Prairie region, and the highest in the Atlantic region. Statistics Canada reported 116,200 full-time job vacancies in Canada during the first three quarters of 1974. The third quarter job vacancies represented an increase of 18 percent over the second quarter of 1974.

Agricultural workers, as a percentage of total employment, have shown a downward trend since 1941. In 1961, agricultural employment in Canada totalled 11.2 percent of total employment (Table 1). By 1973, the percentage of the total labor force employed in agriculture had declined to 5.3 percent. The Economic Council of Canada, in its Ninth Annual Review, projected that agricultural employment will decline to 4.1 percent of total Canadian employment by 1980.

TABLE 1. EMPLOYMENT IN AGRICULTURE BY CLASS OF WORKER, CANADA 1961-73

Year	Total	Paid Workers	Unpaid Family Workers	Self-employed Operators	Agriculture as % Total Employment (All Industries)[2]
			(thousands)[1]		
1961	681	112	133	436	11.2
1962	660	109	138	412	10.6
1963	649	103	142	404	10.2
1964	630	98	134	396	9.5
1965	594	105	127	362	8.7
1966	544	97	110	335	7.6
1967	559	99	122	338	7.6
1968	546	99	128	319	7.2
1969	535	95	125	315	6.9
1970	511	99	116	297	6.5
1971	510	102	118	290	6.3
1972	481	99	110	273	5.8
1973	467	96	100	270	5.3
1974[3]	473	99	103	272	–

[1] Figures may not total due to rounding.

[2] Agricultural employment as a proportion of total persons employed, not total labor force.

[3] Unofficial estimate.

Source: Statistics Canada, Catalogue 71-001 monthly, Labor Force Survey.

Agricultural employment in Canada averaged 615,000 persons between 1962-66 with the average declining to 532,000 persons between 1967-71. For the period 1961-73, the average annual percentage decrease in the total agricultural labor force was 3 percent, increasing above the long-term trend to 3.3 percent a year for the period 1969-73.

The data reported in Table 1 highlights the nature of the reduction in total agricultural employment. Between 1961 and 1973 there was a 166,000 total decrease in the number of self-employed operators with a 33,000 reduction in the number of unpaid family workers. Totalling the decrease for self-employed and unpaid family workers, for the period 1961-73, indicates that these two classes of workers accounted for 93 percent of the decline in total agricultural employment.

Total paid agricultural workers employed annually in agriculture averaged 102,400 between 1962-66, declining to 98,800 between 1967-72. The average annual rate of decline for paid agricultural workers was almost 1 percent, relatively low when compared with the annual rates of decline for total agricultural employment.

An unofficial estimate for total agricultural employment during 1974 of 473,000 persons, compared with 467,000 persons in 1973, suggests that the more recent rate of decline in the agricultural labor force may have been reversed during 1974. In comparison with the 1973 situation, total agricultural employment in Canada increased 1.3 percent in 1974. The general increase in total agricultural employment was reflected in each component of the labor force; paid workers increased 3.1 percent, self-employed persons increased 0.7 percent and unpaid workers increased 3.0 percent. The increase in the agricultural labor force during 1974 reflects the improvement in money wage rates relative to other sectors of the economy, the improved economic conditions for agriculture, off-farm employment opportunities and initiatives taken by governments in the agricultural labor sector.

The largest reduction in regional agricultural employment was 83,000 workers which occurred between 1961-73 in the Prairie region. Other reductions in the same time period were: Quebec 50,000, Ontario 40,000, the Atlantic region 35,000 and British Columbia, 6,000. The data in Table 2 indicate the average annual percentage growth rates for regional agricultural employment. The Atlantic region had the highest annual

TABLE 2. REGIONAL EMPLOYMENT IN AGRICULTURE AND AVERAGE ANNUAL GROWTH RATES,* 1961-73 (BOTH SEXES)

	Canada	Atlantic	Quebec	Ontario	Prairies	British Columbia
			– thousands –			
1961	681	55	138	162	299	27
1962	660	44	132	158	299	27
1963	649	34	124	172	300	18
1964	630	38	114	160	296	22
1965	594	34	116	151	271	22
1966	544	32	106	140	240	25
1967	559	29	114	147	243	25
1968	546	26	121	143	229	26
1969	535	26	107	146	243	23
1970	511	26	105	132	226	23
1971	510	23	98	134	231	25
1972	481	19	97	117	226	22
1973	467	20	88	122	216	21
			Average: (thousands)			
1962-66	615	36	118	156	281	23
1967-71	532	26	109	138	234	24
			Annual Average Growth Rate: (Percentage)			
1961-73	−3.0	−7.8	−2.9	−2.6	−3.0	−0.6
1969-73	−3.3	−8.0	−4.5	−3.3	−2.3	−2.1

Source: Statistics Canada, Catalogue 71-001 monthly.
*All growth rates given are compound rates.

average rate of decline (−7.8 percent between 1961-73), followed by the Prairie region, Quebec, Ontario and British Columbia, in that order. For the most recent five-year period, 1969-73, the rate of decline in the Atlantic region exceeded the long-term trend and increased to 8 percent a year. A substantial increase in the rate of decline for agricultural employment in Quebec to 4.5 percent occurred during the period 1969-73 compared with the long-term trend of 2.9 percent. Ontario and British Columbia also experienced increases in the average annual rates of decline between 1969-73. By contrast, the Prairie region had a reduced rate of decline between 1969-73 at −2.3 percent, compared with the long-term trend of −3.05 percent. The reversal in the rate of decline for agricultural employment in the Prairie region reflects, in part, the improved economic conditions that have prevailed in agriculture during 1972 and 1973 in that region.

Recent studies[1] have indicated that Canadian agricultural output (at constant prices) has been increasing at approximately 2.0 percent a year. Agricultural productivity growth for the period 1961-72 has been variously reported in the range of 1 to 2 percent per annum. A recent Statistics Canada publication (Catalogue 14-201), concerned with aggregate productivity measures, estimated the average annual percentage change in output per man hour in agriculture to be 5.8 percent between 1961-72, 11.1 percent between 1961-66, and 4.3 percent for the period 1966-72. An alternative estimate[2] for Canadian agricultural labor productivity between 1947-65 was 5.5 percent. The results suggest that, while output per man is variable in the short period, primarily because of variations in total output, over the longer period the overall growth rate in output per worker employed in agriculture is between 5.5 and 6.0 percent. There are a variety of factors which contribute to the growth in output per worker, notably changes in the resource combinations of both capital and the variable factor inputs, the level of management efficiency in combining the resources and the influence of adopting new varieties of crops and methods of production, leading to an increased level of output with no change in total inputs and/or a reduction in labor inputs.

[1] Furniss, I. F., *Agricultural Productivity in Canada: Two Decades of Gains.* Canadian Farm Economics, Vol. 5, No. 5, pp. 16-27, December 1970. *Canada's Capacity to Produce Food,* Unpublished Mimeograph, Economics Branch, Agriculture Canada, November 1974.

[2] Auer, L., *Canadian Agricultural Productivity,* Staff Study No. 24, December, 1969, Economic Council of Canada, Queen's Printer, Ottawa.

With the continual trend towards a more highly technical and mechanized agriculture, a considerable degree of factor substitution is occurring; in particular, the substitution of capital for labor. In spite of a declining agricultural labor force, Canadian agricultural output has continued to grow, primarily due to the adoption and application of labor-saving technology. Continued research and development is needed to develop further this type of technology, if the output of Canadian agriculture is to continue its secular growth trend. If labor-saving technology does not continue to develop and become adopted, then manpower may become a constraint upon growth in agricultural output. Another problem area to be discussed, covered in another paper, could be the availability of agricultural credit to finance the capital needed for labor substitution.

Policy Developments

The Department of Manpower and Immigration is responsible for a number of programs designed specifically to facilitate the supply of agricultural workers. Traditionally, the major source of manpower to agriculture through official channels has been the Canada Manpower Centers (CMC). In 1972 and 1973, the C.M.C.'s placed more than 72,000 persons in Agriculture. But while the C.M.C.'s were the major source of farm labor, it was concluded that they were not adequately meeting all farm labor needs, given the crisis situation in agricultural manpower which had developed; thus the Canada Farm Labour Pool (CFLP) was introduced in 1974.

The Department of Manpower and Immigration developed the CFLP program in response to concern expressed by the agricultural sector regarding the acute problems of demand and supply for farm labor. The CFLP program is concerned specifically with the agricultural manpower market. There is, however, a considerable degree of interaction between the CMC's and the CFLP program, the labor pools being designed to complement CMC services in areas of high demand for farm labor. The CFLP's have received a generally favorable response from the farm community during their first year of operation. The 35 CFLP offices opened in 1974 made, between May 1 and October 30, 1974, 14,910 placements and the system handled 20,182 registrations of workers with 23,646 employer vacancies registered. These partial and somewhat incomplete results indicate that the CFLP system satisfied 69 percent of the employer vacancies notified during the six-month period.

The Caribbean seasonal agricultural worker program has been operational for eight years. During the period

1969-72, approximately 1,300 workers entered Canada each year. For 1973 the program doubled the number of workers to 3,048, and there were approximately 5,350 workers brought in during 1974 for more than 500 employers.

An arrangement with Mexico, similar to that covering the entry of Caribbean workers for agricultural work in Canada, was signed in the late spring of 1974. During the 1974 season approximately 200 persons from Mexico were permitted entry into Canada to participate in the agricultural labor force. Both the Caribbean and Mexican movements permit an unlimited number of agricultural workers to be brought into Canada to meet agricultural labor needs when qualified Canadian residents are not available. At any one time the number of non-immigrant workers in Canada from these organized movements ranges from 0-5 percent of the total work force of paid farm workers.

For a number of years European students have assisted with the tobacco harvest on Ontario farms. The tobacco growers generally have been pleased with both the performance of the student workers and the program. During 1972, 675 students participated in the program; this increased to 1,162 in 1973 and the quota was set at 1,400 students for 1974.

To encourage young people in Canada both to consider agriculture as a career or to participate in the agricultural labor force during their summer holidays, the Agriculture for Young Canadians program was introduced in 1974. While each province can receive up to $50,000 federal funding under the program, various provinces developed unique concepts for the involvement of Canadian youth in agriculture during 1974.

Also, in 1974, both the Federal and Provincial governments doubled their contributions over the previous year to programs covered by the Federal-Provincial Agricultural Manpower Agreement which the Department of Manpower and Immigration has with each of the provinces. As well as sharing agricultural manpower research and promotional costs, the agreements provide for financial assistance to farm workers moving from supply areas to areas of high demand and to farmers for the construction or improvement of housing for seasonal farm workers.

In addition to the recruitment, transportation and placement in jobs of agricultural workers, the Federal Government has made a major contribution to farm operators and workers under the Canada Manpower Training Program. The overall costs to the Department of Manpower and Immigration under this program rose from $3 million in 1968-69 to some $10 million in 1973-74. At the same time, the number of places purchased for agricultural training under the program increased during the same period from 4,586 to more than 20,000.

Agricultural Wage Rates

From the hired farm workers point of view, the most important aspects concerning their involvement in agriculture are: the level of farm wages, the non-pecuniary benefits and the conditions of work. On a seasonally-adjusted basis, the aggregate wages and salaries paid in agriculture have increased in the past several years. The average monthly wages and salaries paid in 1972 were $34.1 million, increasing to $37.8 million a month in 1973 and for the first nine months of 1974 averaged $41.3 million (Table 3).

The Statistics Canada report on farm wages[3] summarized in Table 4, showed that, for all Canada between 1961 and 1974 (as at May 15 each year), the hourly wage rate paid, without board, increased from $1.03 to $2.33 per hour. The corresponding increase in the hourly wage rate with board for the same time period was from $0.87 to $2.06 per hour. While the data offer some insight into the average farm wage rate paid, they mask actual wage levels due to the non-pecuniary benefits farm workers receive. Nevertheless, it appears that agricultural money wage rates approximate closely the minimum wage rates paid across the country in 1974.

Since 1972, agricultural wage rates have advanced noticeably. The annual percentage increase in the hourly wage rate with-board between 1972-73 was 12.4 percent and between 1973-74, 19.8 percent; similarly the without-board rate increased 11.8 percent between 1972-73 and 17.1 percent between 1973-74.

Ongoing discussions are taking place between senior levels of governments, farm organizations, and labor groups concerning the extent to which labor legislation needs to be extended to cover the agricultural sector. The topics under discussion include minimum wage levels, hours of work, underage employees, statutory holidays, vacations, workmen's compensation (mandatory or otherwise) and many other conditions of work that apply.

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[3] Statistics Canada, Catalogue 21-002 Occasional.

TABLE 3. WAGES AND SALARIES PAID IN AGRICULTURE ($ million)*

	1972		1973		1974	
	unadjusted	seasonally adjusted	unadjusted	seasonally adjusted	unadjusted	seasonally adjusted
January	21.4	33.0	23.7	36.6	25.4	37.6
February	21.3	33.1	23.8	37.1	24.5	38.0
March	23.7	33.3	26.7	37.5	27.5	38.5
April	27.7	33.4	31.4	37.9	32.4	39.0
May	33.2	33.5	37.8	38.2	39.2	39.5
June	39.7	33.6	45.2	38.5	47.2	40.0
July	46.6	33.9	52.9	38.6	55.7	40.5
August	52.6	34.2	58.9	38.5	63.1	41.0
September	47.0	34.6	51.7	38.2	56.4	41.5
October	38.3	35.0	41.4	37.9		
November	31.1	35.5	33.0	37.6		
December	26.4	35.9	27.4	37.2		
Annual Total	409.0	409.0	453.9	453.8		

Source: Statistics Canada Catalogue 11-0003, Canadian Statistical Review.* Data given refer only to hired workers and salaried employees.

TABLE 4. AVERAGE FARM WAGE RATES OF MALE HELP IN CANADA (MAY 15 EACH YEAR)

	With Board $ per hour	Annual % change	Without Board $ per hour	Annual % change
1961	0.87	–	1.03	–
1962	0.88	1.15	1.03	0.00
1963	0.92	4.54	1.07	3.88
1964	0.96	4.35	1.12	4.67
1965	0.99	3.12	1.15	2.67
1966	1.06	7.07	1.25	8.69
1967	1.15	8.49	1.36	8.80
1968	1.22	6.08	1.41	3.67
1969	1.27	4.09	1.51	7.09
1970	1.32	3.93	1.58	4.63
1971	1.38	4.54	1.65	4.43
1972	1.53	10.87	1.78	7.88
1973	1.72	12.41	1.99	11.80
1974	2.06	19.76	2.33	17.08

Source: Statistics Canada Catalogue 21-002 Occasional.

OUTLOOK FOR 1975

In general terms, the Canadian economic outlook for 1975 is uncertain. The uncertainty stems from the possibility of a recession and has been reflected in recent months by layoffs of automobile workers and reductions in proposed capital investments in a range of industries during 1974-75. There is also considerable strain on the world monetary situation and the liquidity position of developed economies due to the high cost of energy resources. The indirect effect upon agricultural manpower stems from the fact that, if a monetary crisis develops and there is a continued monetary transfer to OPEC countries to pay for energy, Canada's traditional trading partners might be unable to meet their commitments for Canadian exports, resulting in an aggravated employment situation developing in Canada. Essentially, an economic recession, with slowed industrial growth, would lead to reduced investment, lower output,and increased unemployment.

While the number of persons in the agricultural labor force in 1974 was estimated to have slightly exceeded the number in 1973, it is uncertain whether this represented the end of the yearly declines and a plateau being reached or whether it was a slight pause in the decline brought about by higher farm incomes and farm wage levels. As farm expenditures increase and profits narrow on small farms, it is expected that the number of self-employed persons in the agricultural labor force will further decline. While farm labor wages are expected to increase in 1975, the very rapid increase in wage rates in non-agricultural sectors suggests that further declines in the agricultural labor force will occur in the future but may not occur in 1975 if employment opportunities in urban areas tighten. Significant increases in unemployment or other evidence of recession factors will tend to increase rural participation in the agricultural labor force and would also likely increase the desire of some urban workers to seek seasonal employment in agriculture. Currently, a slight decrease in the agricultural labor force is expected in 1975 but any significant change in the economic climate of the non-agricultural sectors could alter the situation.

Federal manpower programs discussed in this paper are to continue in 1975. The degree of expansion or

contraction in some of these programs depends on the response of the Canadian labor force to employment opportunities in the agricultural sector. It is the Federal Government's stated objective to draw fully on the domestic market before proceding with non-immigrant recruitment programs.

FERTILIZERS

  

*I.F. Furniss, R.K. Eyvindson and C.D. Crober**

Fertilizer consumption in Canada set an all-time record in 1973-74. Although prices in 1973-74 were up sharply from year-earlier levels, demand continues strong and sales in the 1974-75 fertilizer year could exceed those of the previous year.

No new major production facilities will come on stream in Canada before 1976-77, so that increased domestic sales will have to come largely from reduced exports.

WORLD FERTILIZER SITUATION**

World consumption of nitrogen, phosphate and potash fertilizers (NPK) almost tripled from 1960 to 1973. However, annual growth rates in consumption have been declining, from about 11 percent a year between 1962 and 1967, to 7 percent between 1967 and 1973. The decline in growth rates has been primarily in the developed countries, although Eastern European countries and the U.S.S.R. have maintained high growth rates. Growth in consumption in the developing countries was about 13 or 14 percent a year between 1967 and 1973.

The higher growth rate in the developing countries in the 1967-73 period was the result of lower fertilizer prices than in the developed countries. One result of this situation, however, was that fertilizer plants were not constructed in the developing countries because supplies were available at lower cost from outside sources. For the same reason, neither were new production facilities constructed in the developed countries in the same period to any extent.

World consumption of NPK increased by an estimated 8.6 percent in 1973-74 over previous-year levels to a total of 65.7 million metric tonnes[1] but capacity increased by a lesser amount, 8.4 percent, to 72.0 million tonnes, indicative of some inventory reduction.

The current world energy supply/price situation did not cause the world fertilizer shortage. Lack of new plant investment because of low returns to the industry did. However, the energy situation has increased production

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**This section is based largely on the following reports:
(a) United States and World Fertilizer Outlook, 1974 and 1980, Agricultural Economic Report No. 257, Economic Research Service, U.S.D.A., May, 1974; and
(b) Supplement to: World Agricultural Situation, The World Fertilizer Situation: 1975, 1976 and 1980, Economic Research Service, U.S.D.A., September, 1974.

[1] All figures in this section are in nutrient, not total product terms. One metric tonne equals 1.1023 short tons and one short ton (2,000 pounds) equals 0.9072 tonnes.

costs, especially for nitrogen, which is energy intensive. Higher fuel costs have also increased shipping and distribution costs for fertilizers. Shipping costs may account, for example, for 20 to 60 percent of the cost of phosphate rock to the manufacturer of phosphatic fertilizers.

WORLD FERTILIZER OUTLOOK*

World production of NPK for 1974-75 has been forecast, on the basis of capacity in place, at 78.2 million tonnes, up by 8.7 percent from the previous-year capacity. At the same time, consumption is forecast at a lesser amount, 71.2 million tonnes, an increase of 8.3 percent in one year and implying some build-up in inventories.

World production of NPK by 1979-80 has been projected to reach 113.1 million tonnes and consumption to reach 95.8 million tonnes, an implied growth rate in consumption of 6.8 percent a year since 1972-73.

Nitrogen

Forecast world nitrogen production and consumption for 1974-75 totals 36.0 and 34.4 million tonnes, respectively. The excess of production over consumption is less than 5 percent of consumption, or about the same degree of market tightness as existed in 1973-74. Also, this production forecast is contingent upon improved performance in the developing regions of the world in bringing new plants on stream as scheduled.

Phosphate

World phosphate supplies in 1974-75 are not expected to be as tight as for nitrogen and this situation should continue into 1975-76. For 1974-75, world phosphate production is estimated at 20.7 million tonnes compared with consumption of 20.0 million tonnes. One possible problem, however, is the supply of phosphate rock which was very tight in 1973-74. The relative shortage is not due to exhaustion of rock reserves but, in the case of Florida, U.S. sources, to environmental constraints and shortages of electric power and equipment needed to develop new mines. Also, current operations are encountering lower grade rock which reduces output by 7 to 10 percent.

*This section is based largely on the following reports:
a) United States and World Fertilizer Outlook, 1974 and 1980, Agricultural Economic Report No. 257, Economic Research Service, U.S.D.A., May, 1974; and
b) Supplement to: World Agricultural Situation, The World Fertilizer Situation: 1975, 1976 and 1980, Economic Research Service, U.S.D.A., September, 1974.

Potash

Forecasts of world potash production, at 21.5 million tonnes, and consumption, at 16.8 million tonnes, indicate a surplus of supply in 1974-75. However, this prediction is based on increased output from Canadian mines. Although the Saskatchewan Government lifted production controls in 1974, increased output from existing mines depends upon an improved labor supply and equipment deliveries to increase the effective capacity.

CANADIAN SITUATION

Consumption

Fertilizer consumption in Canada, in terms of total product, has been increasing at an annual rate of almost 7 percent since the early 1960's. At the beginning of the period, annual consumption was about one million short tons. By 1966, consumption had reached about two million tons and was maintained at this level until 1968. Consumption fell below the two-million-ton level starting in 1969 and it was not until the 1972-73 fertilizer year that consumption exceeded the peak reached in 1968. In the past year, 1973-74, consumption was almost 2.9 million tons, a record, up by 15 percent from the previous-year level (Table 1). Nutrient consumption of total NPK was also at record levels. Expressed in relation to crop acreage, fertilizer consumption in terms of total product has increased from 46 pounds per acre of principal field crops in 1962-66 to 65 pounds in 1967-71 and to 87 pounds in 1973-74.

Although consumption of all major plant nutrients as fertilizers has been increasing, consumption of nitrogen is up the most. In 1973-74, consumption of nitrogen was almost 3.5 times greater than in the 1962-66 period while consumption of P_2O_5 doubled and K_2O consumption increased by more than one and a half times. On a "per acre" basis, consumption of nitrogen has gone from 5 pounds in 1962-66 to 10 pounds in 1967-71 and to 17 pounds in 1973-74. Regionally, the greatest increase in consumption of nitrogeneous fertilizers has been in the Prairie provinces (Table 2). In 1972-73, these provinces consumed 56 percent of the total nitrogen sold to farmers compared with 44.5 percent in 1962-66. Consumption of nitrogen in Ontario and Quebec as a share of the Canadian total has remained relatively constant since 1962-66 but the proportion consumed in the Atlantic provinces and British Columbia declined. The quantity of nitrogen consumed increased, however, in all regions.

TABLE 1. CONSUMPTION OF FERTILIZERS (MIXTURES AND MATERIALS) SOLD IN CANADA, 1962 TO 1974 (YEARS ENDING JUNE 30)

	Average 1962-66	Average 1967-71	1972	1973	1974 Unofficial estimates
			thousand tons of 2000 lb		
Total product sold	1,473	2,070	2,174	2,492	2,871
Nitrogen (N)	163	318	369	452	569
Phosphate (P_2O_5)	269	374	376	458	538
Potash (K_2O)	126	188	207	210	208

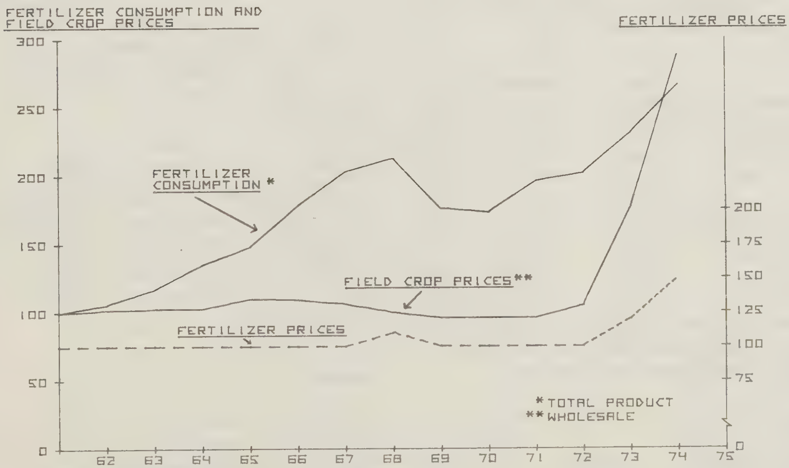
Source: Statistics Canada, *The Fertilizer Trade,* Cat. No. 46-207.

TABLE 2. REGIONAL DISTRIBUTION OF SALES OF NITROGEN CONTAINED IN FERTILIZERS SOLD IN CANADA, 1962 TO 1974 (YEARS ENDED JUNE 30)

	Average 1962-66	Average 1967-71	1972	1973	1974 Unofficial estimates
			percentage of total nitrogen sales		
Atlantic Provinces	7.2	5.0	4.4	3.6	38.5
Quebec	6.4	7.0	8.2	6.8	
Ontario	38.0	36.4	38.6	31.2	61.5
Prairie Provinces	44.5	48.7	46.0	55.8	
British Columbia	3.9	2.9	2.8	2.6	

Source: Based on data reported by Statistics Canada, *The Fertilizer Trade,* Cat. No. 46-207.

FIGURE 1. INDICES OF FERTILIZER CONSUMPTION, FERTILIZER PRICES AND FIELD CROP PRICES, CANADA, 1961 TO 1974 (PRELIMINARY) (1961=100)



SOURCE: DATA FROM STATISTICS CANADA.
1974 ESTIMATES UNOFFICIAL.

Prices

An important factor contributing to the rapid growth in fertilizer consumption during the period reviewed was the relatively stable price situation for fertilizers. In 1972, prices were only 3 percent higher than in 1961. After a period of relatively slow growth in the early post-war years, the Canadian fertilizer industry expanded rapidly in the early 1960's. Production of nitrogen and phosphatic fertilizers increased about two and one-half times and Canada became a major potash producer. By the mid-1960's, fertilizer output outstripped demand and prices were such that rates of return to the industry discouraged the construction of new capacity. The over-supply of fertilizers was compounded by the sharp drop in domestic consumption, as illustrated in Figure 1, beginning in 1969, brought about by the decline in crop returns.

By 1973, with the improved demand and prices for Western grains, fertilizer consumption at pre-1973 prices began to overtake capacity (supply) and prices rose by an average of 12 percent over year-earlier levels (Table 3). In the spring of 1974, prices were up again with the increase over previous-spring levels amounting to an average of 31 percent. Price increases for fertilizers were generally greater in the West than in the East until 1973. In that year, prices of fertilizers rose by 14 percent in Eastern Canada compared with 8.5 percent in the West. Spring 1974 prices were higher by 36 percent in the East compared with a 17 percent increase in the West over year-earlier price levels.

TABLE 3. INDEXES OF FERTILIZER PRICES, CANADA, 1962 TO 1974 (1961 = 100)

Period or Year	Eastern Canada	Western Canada	All Canada
Average, 1962-66	101.1	103.0	101.3
Average, 1967-71	98.9	104.7	100.4
1972	100.3	110.4	103.0
1973	114.0	119.8	115.5
Second Quarter, 1973	112.2	117.5	113.6
Second Quarter, 1974	152.5	137.9	148.7
Third Quarter, 1973	113.1	119.8	114.9
Third Quarter, 1974	174.3	159.4	170.4

Source: Statistics Canada, *Farm Input Price Index*, Cat. No. 62-004. The indexes given refer to the totals of fertilizer materials and mixed fertilizers.

Nitrogen

Ten fertilizer producers operate plants at 15 different locations across Canada for the production of basic nitrogen and phosphatic fertilizer materials. These plants were built for the most part to serve both domestic and contiguous United States markets. Canadian production capacity for nitrogen in 1973-74 was estimated at one and a quarter million short tons a year. After allowing for industrial uses, more than 75 percent of the total output is available for agricultural purposes in either domestic or export markets. Since the industry was operating essentially at capacity in 1973-74, domestic consumption accounted for about 60 percent of Canadian capacity for agricultural uses. This compares with 40 percent as recently as 1969-70. Canadian exports of nitrogen for all uses in nutrient form were down by 6 percent in the 1973-74 fertilizer year from the previous-year exports.

A number of industrial disputes in 1974 in the basic fertilizer manufacturing industries in Canada has affected supply and replenishment of inventories. A four-month strike at Cominco was settled in November. Noranda and CIL, large producers of phosphatic fertilizers for the Eastern Canadian market, have been out of production due to industrial disputes since mid-summer and, as of December, these disputes were not settled. In Manitoba, a dispute at the Simplot plant has been settled but technical problems have severely affected nitrogen production.

Phosphate

Canadian production capacity for P_2O_5 in 1973-74 was estimated at more than one million short tons a year, about three-quarters for agricultural consumption. The Canadian industry depends entirely on imports of phosphate rock for its raw materials, principally from the United States. Imports in 1973-74 totalled 3.6 million tons, 17 percent higher than in 1972-73. Imports of phosphatic fertilizers, at 81,000 tons, in terms of total product, were down by 33 percent in the same period.

In 1973-74, the phosphate production industry in Canada was operating at almost production capacity. As with nitrogen, Canadian exports of phosphatic fertilizers are decreasing to allow for an increase in supplies for the domestic market. Exports in 1973-74 were down by more than 7 percent from previous-year levels in nutrient terms.

Potash

Canadian production capacity for K_2O in 1973-74 was estimated at 8.3 million short tons. Production has risen steadily from about 40 percent of capacity in 1970-71 to about 70 percent in 1973-74. In 1974, the Saskatchewan Government lifted controls on output,

PLEASE ATTACH THIS CORRECTION TO PAGE 15 OF CANADIAN FARM ECONOMICS, DECEMBER 1974.

PLEASE NOTE: – Correction to **CANADIAN FARM ECONOMICS,** Volume 9, Number 6, Page 15:

The last sentence of the page read, "The model is adequate in its present form." In its place please add,

"The model is adequate in its present form for research purposes (e.g., evaluating results of feeding experiments, or assisting in establishing priorities for further experiments, or both). The routine use of such a model by feed mill and feedlot operators, however, requires a much more extensive package of services than that needed for research. The development of capability for such use is needed if the full potential of research results is to be realized at the producer level.[7] This suggests a need for greater involvement of extension agencies (provincial, university, Canfarm) in the kind of research work described in this article.

[7]W. Candler, M. Boehlje, R. Saathoff, Computer Software for Farm Management Extension, Am. J. Agr. Econ. 52(1): pp. 71-80, 1970".

opening up the way for increased production. More than 95 percent of current Saskatchewan potash production, representing about 20 percent of world consumption, is exported, largely to the United States market. Potash exports in 1973-74 were up by 35 percent from the level of the previous year while production increased by about the same.

CANADIAN OUTLOOK

Consumption

In this section, an attempt will be made to forecast fertilizer consumption in Canada, both short-term and longer-term, on the basis of past economic relationships and under several different assumptions about the future. As noted in the Situation, fertilizer prices were relatively constant in nominal terms from 1961 to 1972. However, with the sharp price increases experienced beginning in 1973 and continuing into 1974-75, forecasts of future demand should take into account such price changes to reflect the changed economic conditions. At the same time, it should be recognized that relative price changes also have a bearing on the demand for fertilizers. Thus, if fertilizer prices increase relatively less than crop prices, then the demand for fertilizers can be expected to remain strong. Figure 1 illustrates this kind of relationship: the increase in field crop prices (in wholesale markets) has been more rapid recently than the increase in fertilizer prices.

The demand for fertilizer is expected to continue strong in 1974-75, both in Canada and on a world-wide basis. The favorable current fertilizer-crop price relationship in Canada supports this forecast. While fertilizer prices in the fall of 1974 were up by about 48 percent from a year ago, major field crop prices averaged almost the same increase over year-earlier levels. On the basis of past statistical relationships, a demand increase for fertilizer of about 25 percent was implied as of the fall of 1974.[2] An offsetting factor, however, is that price increases for fertilizers in the fall of 1974 were relatively larger than for almost any other major class of purchased inputs (purchased seed was one exception).

Supply

Canadian fertilizer industry sources were forecasting, as of November, an 11-percent increase in the domestic supply of fertilizers in 1974-75, after taking into account lost production in 1974 due to lengthy labor disputes in the industry. Most of this increase would be in potassic fertilizers, up by 38 percent, and with increases of 18 percent in phosphates and 8 percent for nitrogen. Most of the increased nitrogen supply for the domestic market will be at the expense of export markets. While the Canadian fertilizer industry has the productive capacity to meet increased domestic demands for nitrogeneous, phosphatic and potassic fertilizers, the low inventories at the beginning of the 1974-75 fertilizer year as a result of the heavy sales in 1973-74 and the 1974 labor disputes, together with problems of shutdowns for major plant maintenance, heighten the possibility of regional fertilizer shortages in 1974-75.

Shipments of fertilizers and materials to the United States in 1974-75 are expected to increase by about 12 percent in nutrient terms, with increased shipments of potash offsetting declines in nitrogen and phosphates. Offshore shipments in nutrient terms could be up by 12 percent also as a result of increased potash supplies. However, this latter forecast may not be realized because of labor and equipment shortages being encountered by the potash producers.

There appears to have been a shift in farmers' buying habits for fertilizers in recent years which has tended to dampen the highly seasonal nature of the demand for fertilizers in Canada. In 1973-74, fertilizer sales in the fall and winter months were heavier than in previous years. Reports from the industry indicated that purchases by farmers in the fall of 1974 were ahead of year-earlier levels in some areas but, in others, because of the effects on production of the lengthy labor disputes, deliveries were behind those of a year ago.

Nitrogen

Demand for nitrogen fertilizers by Canadian farmers is expected to continue to rise and be between 700,000 and 900,000 short tons by 1980.[3] The consumption of 700,000 tons by 1980 would represent an implied growth rate from 1972-73 of 6.5 percent a year while the higher forecast would correspond to an increase of 10.3 percent a year.

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[2] Everything else being equal, and they usually are not, buyer response in the past has been that higher prices for crops generate a proportionately greater increase in demand than the demand decreases as a result of fertilizer price increases.

[3] These forecasts are based on a projected increased acreage in field crops in the Prairie provinces as a result of reduced summerfallow acreage. The lower bound of the forecast assumes that real nitrogen prices will rise over the period while the upper bound assumes no nitrogen price effect on demand. Forecasts published recently by the U.S.D.A. for Canada (see Footnote **(a) indicate consumption by 1979-80 of 827,000 short tons of nitrogen; 827,000 tons of phosphate and 330,000 tons of potash. These forecasts imply a growth rate of 7.8 percent a year from 1972-73 to 1979-80 of NPK. They are based on the current and planned North American fertilizer production capacity; a continuation of Canada's 1972-73 share of it; and certain assumptions about grain and fertilizer prices.

A number of significant plant expansions for nitrogen production are underway in Western Canada but none of these will come on stream before 1976-77. One new plant of 1,200 tons per day of ammonia plus 1,500 tons per day of urea is under construction at Medicine Hat, Alberta. This plant, to be operated by a company called Canadian Fertilizer Limited, is owned by Canadian and United States farmer supply co-operatives. It has obtained the necessary permits from the Alberta Oil and Gas Conservation Board but production will not commence before late 1976. Permits have been granted also to Cominco and Sherritt-Gordon for expansions of comparable size. In the East, the only expansion underway is that of Beker Industries at Sarnia, Ontario. Startup is planned for early 1975 with a capacity of 130,000 tons of ammonia annually, most of which is intended for export to the United States.

In the United States, two new nitrogen plants came into production in 1974 and will add from 3 to 4 percent to North American capacity. This increased capacity, however, will just offset losses in 1974-75 production due to plant shut-downs for major maintenance.

Phosphate

Demand for phosphate fertilizers in Canada is expected to continue to grow and to be between 630,000 and 680,000 tons by 1979-80, implied growth rates of 4.7 to 5.8 percent a year since 1972-73. Although the industry is operating currently at production capacity, significant expansion plans are not under active consideration for Canada. Several new plants under construction in 1974 in the United States are expected to come on stream in time to relieve some of the shortages in supplies in 1974-75.

Potash

Most of Canada's potash production goes to export markets, principally the United States, but also to offshore markets. The disposition of 1974-75 production is expected to follow the pattern of the recent past, that is, 67 percent to the U.S. market, 29 percent to offshore markets and 4 percent to the Canadian market. Demand for potash in Canada is predicted to reach between 330,000 and 360,000 tons by 1979-80, implied growth of 6.7 to 8.0 percent a year since 1972-73.

In 1974, the Government of Saskatchewan lifted production controls on potash so as to permit the industry to expand to its rated capacity and take advantage of the strong world demand. However, current labor and equipment problems may prevent the industry from reaching this goal in 1975. No new potash mines are currently under development in Canada.

Prices

Fall 1974 fertilizer prices in Canada were up by 48 percent from year-earlier levels. The price increase was greater in Eastern Canada than in the West. In the East, prices rose by 54 percent while, in the West, the increase amounted to 33 percent. Higher prices for fertilizers in 1974-75 are the result of a number of factors including the demand pressure on a relatively fixed supply, higher costs for raw materials such as natural gas and phosphate rock, and higher transportation costs.

Fertilizer prices have increased less in 1974-75 in Canada than in the United States. Prices in the United States in the fall of 1974 were as much as 40 to 50 percent higher than Western Canadian prices. This resulted in some domestically-committed supplies moving to U.S. customers. While some further price increases seem likely in Canada, both short-run and longer-run, because of the continuing strong demand and further cost increases expected for energy, raw materials and transportation, they may be tempered in the short-run by an apparent easing of demand pressures at current prices in the United States. In that market, a significant decline in fertilizer sales over previous-year sales for winter wheat application occurred in the fall of 1974.

EFFICIENCY IN USE OF FERTILIZER

Efficient use of fertilizer is a valuable practice for farmers at all times but it is even more important in times when fertilizer is in short supply and prices are high. To make efficient use of fertilizer, farmers need to know the fertility level of the soil in each field, the yield increase to be expected for each crop from various levels of nutrient availability, the cost of fertilizer and the expected prices of various crops. In addition, if there are limits on the amount of fertilizer that can be obtained, either because of shortages or because of capital limitations, the amount of fertilizer available needs to be known. With this information the farmer can allocate a fixed amount of fertilizer between fields in such a way that the maximum return is obtained from the available fertilizer or, in the case of unlimited availability of fertilizer, the farmer can determine the level of fertilizer application for each field that will equate the additional income from a unit of fertilizer with the cost of a unit of fertilizer.

Farmers who do not wish to make a detailed calculation of optimal fertilizer application rates should obtain information on soil fertility and on yield response to various nutrient levels. In using this information to set up a fertilizer program, two factors need to be borne in mind. First, the principle of diminishing returns should be recognized. That is, as fertilizer application rates

increase the additional yield obtained per unit of additional fertilizer decreases. This suggests that, if fertilizer availability is limited, rates of application should be reduced on all fields rather than maintaining rates of application on some fields while leaving other fields unfertilized. However, in applying this general principle, the level of fertility of different fields as indicated by soil tests must be considered. The second factor that should be considered is that different crops have different responses to fertilizer and have different values per acre. Thus, a given amount of fertilizer applied to one crop may result in a higher return than if the same amount of fertilizer was divided between two or more crops.

Two other practices which improve the efficiency of fertilizer use are: (1) the correction of the acidity level of the soil by liming to the optimal range for the crops being grown; and, (2) the maximum use of manure and crop residues. Manure and crop residues not only add nutrients to the soil but also improve the soil tilth.

FERTILIZER TECHNOLOGY

Research in the fertilizer industry has concentrated and will continue to concentrate on the development of cheaper processes of producing materials currently being used and on the development of new materials which either have lower production costs, or have lower distribution, storage and marketing costs. An example of this is the development of urea as a fertilizer material. Urea has a high nutrient content (and, therefore, relatively low transport costs) and is not a hazardous product as are some other fertilizer materials. In addition, recent technological developments have reduced the costs of producing urea and have increased the granular size, thus lowering the absorption of water from the air. Because of these advantages, it is expected that urea will make up a larger share of the nitrogen fertilizer market in the future. Another example of this type of change is the increasing use of anhydrous ammonia, which is an even higher analysis fertilizer than urea and the cost of nutrient is relatively low. However, there are disadvantages to anhydrous ammonia in that it is a hazardous product, and expensive, specialized pressure vessels are required for storage, transportation and application. For these and other reasons, its use is expected to level off in favor of urea because the latter offers much better handling characteristics and generally lower costs for manufacturing, storage and transportation.

Another change that is occurring in the fertilizer industry is the development of slow-release nitrogen materials. Unlike phosphate and potash, nitrogen is readily soluble in water and, as a result, losses of nitrogen can occur during the growing season. Currently, urea-formaldehyde and plastic or sulphur-coated granular slow-release nitrogen fertilizer products are available on the market. However, because of their high cost per unit of plant food, use of such products has been restricted to non-commercial uses, for example, lawns. Further research into slow-release nitrogen fertilizer can be expected in the future, particularly in the light of the current high costs of nitrogen.

Although non-pressurized liquid nitrogen fertilizer has taken an increased share of the market in recent years, such fertilizers have disadvantages which may limit future growth in use. The major drawback is the limitation on concentration. In order to maintain nitrogen in a non-pressurized liquid state without recrystallization at low temperatures, the concentration of nitrogen cannot exceed 32 percent. Some work has been done on the development of suspension liquid fertilizers which do not suffer from concentration problems. However, suitable equipment for the application of this type of product is not readily available commercially.

One of the most important characteristics of bulk blend fertilizer is uniform particle size. Uniform particle size prevents segregation of the particles during transport and storage and thus insures that a uniform distribution of nutrients is obtained when the fertilizer is spread on the land. Because of the importance of this factor, considerable work is needed on the development of production processes that will ensure that the particle size of all blending materials is within an acceptable range.

SUMMARY

Fertilizer consumption in Canada set an all-time record in 1973-74. Although prices in 1973-74 were up sharply from year-earlier levels, demand continues strong and sales in the 1974-75 fertilizer year could exceed those of the previous year.

No new major production facilities will come on stream in Canada before 1976-77, so that increased domestic sales will have to come largely from reduced exports. Production, especially of nitrogen and phosphates, was affected in 1974 by lengthy shut-downs in several major manufacturing facilities due to industrial disputes. Consequently, with inventories at a very low level at the beginning of the 1975 calendar year, the supply situation is tight.

Prices in Canada in the winter of 1974-75 are generally below United States and world levels. Although further price rises may occur in the spring because of higher

material and transportation costs, increased buyer resistance, noted especially in the United States market, may temper such increases.

With the current high prices for fertilizers, more efficient use should be made of the available supply to maximize returns. These include soil testing and reducing, if necessary, the application rates. In the area of fertilizer technology, current developments are contributing to lower distribution, storage and marketing costs by reducing the amounts of inert materials, improving storability and developing new methods of fertilizer application that reduce nutrient losses.

ACKNOWLEDGMENTS

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ENERGY

O.R. Morris*

Barring any political crisis in the OPEC countries, there will be sufficient petroleum supplies available to produce and process Canada's agricultural production in 1975. Agriculture has a high priority in the Federal Government's allocation plans, should these become necessary.

Prices of domestically-produced petroleum products may move closer to world prices; electricity rates may increase 10 to 15 percent a year for several years; and natural gas rates are expected to increase until they commensurate with petroleum prices.

There may be some supply shortfalls of gas in Eastern Canada by 1976-77 for industrial users, due to a lack of pipeline transport capacity.

INTRODUCTION

Three basic questions dominated the preparation of this paper: (1) Will Canadian farmers and agricultural product processors have sufficient energy supplies to produce and process the 1975 agricultural product? (2) What are reasonable expectations for future energy prices, particularly during 1975? (3) What is the long-run outlook for energy inputs into Canadian agriculture? These questions necessitate examination of the world situation and outlook for energy, particularly in the petroleum market, as well as these markets on the North American continent. Discussion of the electricity and natural gas situation and outlook are deferred to the section on the domestic energy situation and outlook primarily because the demands for these energy sources are domestic with some exports to the United States.

WORLD PETROLEUM SITUATION

During the 1960's, the oil exporting countries were unable to control prices because the United States had sufficient marginal capacity to offset a threat of curtailment. By 1970, the U.S. output had peaked and increasing U.S. demands had to be met by increasing imports, especially from the Middle East. The oil embargo in late 1973 had the side effect of reducing oil supplies to Eastern Canada and of pushing up world oil prices to record levels. Examination of the history of oil prices during the 1960's and 1970's, as well as consideration of the relative proportions of production costs, transportation charges, company profits, and taxes and royalties paid to governments of producing countries, reveals how much political decisions influence the world prices for crude oil.

There are several principal components in the price of a barrel (35 Canadian gallons) of crude oil. The production costs are the expenses associated with getting the oil out of the ground; these run less than 20 cents a barrel in the Middle East and North Africa. The oil-producing companies must pay to the governments of the oil-exporting countries royalties and income taxes; in October, 1974, these payments were running between \$9.30 and \$9.70 a barrel on more than half of the crude oil exported from the Middle East. The sum of production costs, taxes, and royalties is referred to as the tax-paid cost.

During the 1960's, the tax-paid cost was about \$1.00 a barrel; it had risen to \$1.37 by 1971 and, by October 1973, the tax-paid cost was \$1.90 a barrel. In mid-October, 1973, the tax-paid cost was nearly doubled to \$3.16 a barrel. On January 1, 1974, the tax-paid cost of Arabian light crude nearly doubled again to \$7.12 a barrel. By October 1974, the tax-paid cost had risen to \$9.845 a barrel in Saudi Arabia and to \$9.538 a barrel in Iran; these two countries accounted for 43 percent of the OPEC crude oil exports in 1972.

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The tax-paid cost does not cover transportation costs to North America, nor does it include anything for oil-producing company profits. Transportation costs from the Persian Gulf by tanker ship are about $1.50 a barrel. Oil company profits are reported to be as low as 20 cents a barrel, but 45 cents a barrel is more typical, while 50 cents a barrel would be quite rare. Adding transportation costs and oil company profits to the tax-paid cost, the price of imported light Arabian crude oil landed in Eastern Canada and the Eastern United States is in the neighborhood of $11.60. Since heavier crude oils yield greater proportions of lower-valued products and require more catalytic cracking, they are priced accordingly lower. Of this $11.60 a barrel, only $1.95 represents payments for productive services; this represents about 17 percent of the total cost per barrel to the refinery. Eighty-three percent of the imported crude oil price in Canada is a result of a political decision by foreign governments.

The demand for crude oil is relatively inelastic, meaning that the responses in the quantities purchased with respect to price changes are quite small. The four-fold price increase, that is, 300 percent, between 1973 and 1974, provoked only a .55 million barrels a day reduction in oil imports to the United States; this is less than 9 percent of the U.S. daily consumption and less than 2 percent worldwide. This implies that the OPEC countries can continue to expect to use their price-setting powers effectively in crude oil markets.

Even though political decisions are arbitrary, they are not usually made without regard to their consequences. Most oil-exporting countries are importers of foodstuffs, investment goods and manufactured consumer goods. The countries exporting these commodities could lessen the costs of their oil imports by imposing export taxes on their exports. But, in the longer term, some energy substitution is possible; for example, electric home heating can replace oil-fired home furnaces and coal can be used to generate electricity.

The preceeding discussion portrays a serious situation completely dominated by the OPEC countries. However, there is some possibility of eventual price relief. World production exceeded consumption by nearly 3 million barrels a day through June – July 1974. Kuwait, Iraq, Libya, and Venezuela reduced the surplus to 500,000 barrels per day by September. On the other hand, Saudi Arabia production boosted the surplus to 1.5 million barrels a day by October. In October 1974, 17 percent of crude oil production capacity was shut in; this represents nearly 6 million barrels a day. Saudi Arabia is the only individual OPEC country which can influence oil prices over a significant range by shutting in or expanding production.

The long-term market situation depends upon how well the OPEC countries can maintain their cartel arrangement. Venezuela, Ecuador, Iraq, Indonesia, Algeria, and Nigeria all have large revenue requirements which must come from oil exports. These revenues have been earmarked to support government programs whose costs have been increasing quite rapidly due to inflation. These countries would like to obtain a larger proportion of the world market at current crude oil prices. If these countries expand their production along anticipated lines until 1980, they will be exporting 13.9 million barrels a day. Against the projected demands for 1980, this leaves only 10 million barrels per day for the rest of the OPEC countries to share among themselves; the latter situation is surely too much to expect.

So far as the world supply situation is concerned, world oil production will peak between 1985 and 2000 and decline thereafter. In the short term, the potential supply available for world markets will be quite adequate, but the actual supply reaching the market may be restricted by international political and economic factors that are beyond the control of consuming countries and difficult, if not impossible, to quantify or predict.

NORTH AMERICAN PETROLEUM SITUATION

Except possibly for its political relations with the Arab nations in OPEC, the United States faces the same uncertainties as Canada with respect to its crude oil imports and imported crude oil prices. These were discussed in the previous section. Thus, the discussion in this section will be limited to some brief remarks about the possible effects of U.S. import controls for crude oil and to the pricing of U.S. domestic crude oil production.

The U.S. accounts for nearly 20 percent of all oil in international trade – 6.2 million barrels a day out of 33 million barrels a day for the world in 1973. In the short run, large changes in U.S. imports are nearly impossible without devastating an economy officially in an economic recession in 1974. In the intermediate future, by 1980 modest reductions in imports are possible; OECD suggests that the United States will reduce oil imports by 1.6 million barrels a day for every $1 increase in the U.S. domestic price. For the OPEC countries exporting oil to the U.S. and who are trying to maximize revenues to support expensive domestic programs in their countries, the longer run may not matter; they need the funds now. But for those countries

interested in the longer run, the threat of import controls may be an effective bargaining tool for the U.S. when negotiating with these OPEC countries. It has been noted by the U.S. Federal Energy Administration that import controls may be self-defeating – if OPEC cannot sell significantly more oil at lower prices, there is no reason to lower them in the first place.

The U.S. domestic pricing policy distinguishes between two types of oil. "Old oil", about 60 percent of U.S. domestic production, is priced at $5.25 a barrel, while the remaining production, "new oil", is marketed domestically at world prices. The two types of oil are then "blended" according to the total amount of domestic oil produced under the two prices. In January, 1974, domestic crude oil was costing U.S. refiners an average of $6.79 a barrel, while the average price for imported crude was $9.60 a barrel; the average price a barrel to U.S. refiners was $7.51. By June, the effect of the January 1, 1974 price increase by OPEC was being felt in the U.S. Domestic crude oil was costing U.S. refiners $7.27 a barrel, imported crude was costing them $13.20 a barrel, and their average price a barrel purchased was $9.39. By August, some decrease in both the domestic and imported prices had occurred and the average cost to U.S. refiners had dropped to $9.19 a barrel.

With the present U.S. oil pricing policy, it is clear that the U.S. prices will tend toward world prices as the older wells are depleted and as more new wells come into production of domestic crude oil at world prices.

CANADIAN SITUATION AND OUTLOOK FOR PETROLEUM PRODUCTS

Table 1 contains data pertaining to the quarterly production, net sales and closing inventories of motor gasoline, diesel fuel oil, light fuel oil, and liquified petroleum gases in Canada for the period 1962 to 1974. Examination of this data shows a strong general trend for expansion by the Canadian refining industry. The data shows that Canadian petroleum energy supplies have continued to expand in the face of the energy crisis in the world. No data was found which cast serious doubt upon the continuation of this trend into 1975.

TABLE 1. PRODUCTION, NET SALES AND CLOSING INVENTORIES OF MOTOR GASOLINE, DIESEL FUEL OIL, LIGHT FUEL OIL AND LIQUIFIED PETROLEUM GASES, IN CANADA, 1962-66, 1967-71 TO 1974

(thousand barrels of 35 Canadian gallons)

Year and Quarter	PRODUCTION				
	Motor Gasoline	Diesel Fuel Oil	Light Fuel Oil[a]	Liquified Petroleum Gases	
1974					
1	51,327	16,190	34,979	2,154	March
2	50,940	19,689	25,366		June
3					Sept.
4					Dec.
1973	201,230	69,494	118,202	7,936	
1	45,333	15,906	33,673	1,997	March
2	47,808	17,926	22,896	1,705	June
3	55,718	18,556	28,895	2,260	Sept.
4	52,371	17,106	32,738	1,974	Dec.
1972	185,378	64,747	107,543	6,980	
1	43,814	13,715	30,952	1,684	March
2	41,946	16,273	21,649	1,654	June
3	50,884	18,042	25,536	1,974	Sept.
4	48,734	16,717	29,406	1,668	Dec.
1971	166,989	60,505	101,819	7,487	
1	39,470	12,530	28,463	2,048	March
2	38,208	14,753	21,362	1,719	June
3	45,521	17,580	23,166	1,871	Sept.
4	43,790	15,742	28,828	1,849	Dec.
Av 1967-71	154,850	51,654	89,863	8,498	
Av 1962-66	121,659	36,458	77,438	7,496	

Year and Quarter	Motor Gasoline	Diesel Fuel Oil	Light Fuel Oil[a]	Liquified Petroleum Gases	
			NET SALES		
1974					
1	45,543	14,581	54,589	1,717	March
2	52,311	17,317	22,638	1,387	June
3					Sept.
4					Dec.
1973	203,406	62,394	124,361	6,183	
1	43,284	12,995	51,470	1,670	March
2	50,688	15,722	20,928	1,346	June
3	58,005	17,004	11,709	1,658	Sept.
4	51,429	16,673	40,254	1,509	Dec.
1972	184,770	55,817	131,810	6,170	
1	39,837	11,894	56,549	1,655	March
2	45,933	14,406	21,799	1,334	June
3	52,564	15,140	10,574	1,565	Sept.
4	46,436	14,377	42,888	1,616	Dec.
1971	174,952	51,272	122,278	5,591	
1	36,619	10,352	51,545	1,391	March
2	43,259	13,250	20,265	1,109	June
3	50,612	14,600	11,301	1,474	Sept.
4	44,462	13,070	39,167	1,617	Dec.
Av 1967-71	159,301	45,558	114,494	4,699	
Av 1962-66	121,904	32,917	92,252	6,821	
			CLOSING INVENTORIES		
1974					
1	26,322	11,296	24,020	606	March
2	25,904	13,409	27,638	570	June
3					
4					
1973	21,543	14,875	36,422	592	
1	25,937	11,484	17,085	360	March
2	21,749	12,474	21,013	471	June
3	20,497	16,374	39,085	513	Sept.
4	21,543	14,875	36,422	592	Dec.
1972	22,991	13,579	29,312	377	
1	25,461	10,419	15,490	340	March
2	22,106	11,587	19,995	387	June
3	20,929	14,921	36,945	428	Sept.
4	22,991	13,579	29,312	377	Dec.
1971	21,783	13,341	33,008	357	
1	27,118	9,977	15,195	413	March
2	24,008	11,626	20,383	509	June
3	21,320	14,576	37,025	443	Sept.
4	21,783	13,341	33,008	357	Dec.
Av 1967-71	23,403	11,572	30,310	397	
Av 1962-66	20,498	8,057	27,818	416	

[a]Includes stove oil, kerosene and tractor fuel.

Source: *Canadian Statistical Review,* Catalogue Number 11-505 and 11-003, Statistics Canada.

Table 2 contains data pertaining to the regional net sales of petroleum products in Canada. These data indicate the general trend to increased sales of motor gasoline, diesel fuel oil, and light fuel oils over the most recent decade. Most of this expansion is due to an expanded Canadian economy producing more goods and services.

TABLE 2. NET SALES OF PETROLEUM PRODUCTS AVAILABLE FOR DISTRIBUTION IN CANADA, BY PROVINCE, YEAR (1962-66, 1967-71 TO 1974), AND PRODUCT

(thousand barrels of 35 Canadian gallons)

Year	Atlantic Provinces	Quebec	Ontario	Prairies	B.C.	Canada[a]	Year	Atlantic Provinces	Quebec	Ontario	Prairies	B.C.	Canada[a]
			Motor Gasoline							Diesel Fuel Oil			
1974			Not available				1974			Not available			
1973	17,233	48,016	75,280	41,424	20,956	203,460	1973	8,579	11,499	13,727	16,553	10,570	62,394
1972	15,619	44,396	68,503	37,433	19,050	185,495	1972	7,384	9,943	12,200	15,126	9,448	55,391
1971	13,595	41,702	64,407	35,578	17,645	173,386	1971	6,981	8,827	11,497	13,770	8,725	51,020
Av 1967-71	12,277	39,133	58,220	33,270	15,750	158,973	Av 1967-71	6,392	8,171	10,008	12,953	7,463	45,769
Av 1962-66	9,014	27,915	45,400	27,773	11,580	121,890	Av 1962-66	4,278	6,824	6,406	10,053[c]	5,113[d]	32,912
			Light Fuel Oil							Kerosene and Stove Oil			
1974			Not available				1974			Not available			
1973	17,801	38,816	38,912	4,086	7,558	107,821	1973						
1972	17,356	41,133	41,848	4,449	7,428	112,829	1972	4,854	6,809	3,169	3,198	1,703	20,015
1971	14,003	38,879	39,672	4,211	6,702	104,000	1971	4,560	6,230	3,425	2,845	1,700	19,056
Av 1967-71	12,057	34,854	38,877	4,453	5,647	95,858	Av 1967-71[b]	4,522	6,364	3,473	2,900	1,773	19,311
Av 1962-66	7,833	23,997	31,995	5,201	4,589	73,820	Av 1962-66	3,741	6,200	3,766	2,519[c]	1,822[d]	18,153

[a] Includes North-West Territories and Yukon
[b] Includes Tractor Fuel Oil prior to 1969
[c] Includes North-West Territories
[d] Includes Yukon

Source: *Refined Petroleum Products,* Catalogue No. 45-208, Statistics Canada, Ottawa; Canadian Statistical Review, Statistics Canada.

TABLE 3. NET SALES OF MOTOR GASOLINE AND DIESEL FUEL OIL, TO FARMS FOR CANADA, BY PROVINCE, YEAR (1962-66, 1967-71 TO 1974) AND PRODUCT

Year	Atlantic Provinces	Quebec	Ontario	Prairies	B.C.	Canada[a]
			Motor Gasoline			
1974			Not available			
1973	804	1,600	4,570	11,694	967	19,654
1972	783	1,534	4,417	11,169	925	18,850
1971	889	1,423	4,373	10,839	929	18,473
Av 1967-71	916	1,630	4,494	10,146	841	18,047
Av 1962-66			Not available			
			Diesel Fuel Oil			
1974			Not available			
1973	414	497	1,160	4,862	368	7,307
1972	372	423	1,029	4,328	340	6,498
1971	329	340	971	4,068	376	6,086
Av 1967-71			Not available			
Av 1962-66			Not available			

[a]Includes North-West Territories and Yukon

Source: *Refined Petroleum Products*, Catalogue No. 45-208, Statistics Canada; Canadian Statistical Review, Statistics Canada, Ottawa.

Information on the net sales of motor gasoline and diesel fuel oil to farms in Canada for the period 1967 through 1973 is presented in Table 3. Gasoline sales to farms increased notably in 1973, as did sales of diesel fuel. Diesel fuel has become relatively more important as a source of energy in agriculture, reflecting a shift from gasoline to diesel tractors.

Table 4 contains indices of farm input prices for petroleum products in Canada during the period 1962 to 1974. The increase in petroleum product prices has been significantly higher in Eastern Canada than in Western Canada. After following a steady upward trend, prices increased sharply in 1973 and 1974. By the third quarter of 1974, petroleum product prices in Eastern Canada were 37 percent higher than they were two years earlier; the increase in Western Canada was almost 20 percent, and for Canada as a whole, 26 percent. Most of the increase occurred in 1974.

Farmers' current expenditures for fuel and oil have been increasing both in current and in real terms (Table 5). However, current expenses for electricity and tele-

TABLE 4. FARM INPUT PRICE INDEX: PETROLEUM PRODUCTS, CANADA 1962 TO 1974

Year	East	West	Canada
	(1961 = 100)		
1974			
1	155.6	130.3	138.6
2	155.8	126.8	136.4
3	173.3	140.6	151.4
4			
1973	135.6	123.5	127.5
1	125.9	120.7	122.4
2	128.7	120.9	123.5
3	139.7	123.7	129.0
4	147.9	128.5	134.9
1972	125.8	117.1	120.0
1	126.4	116.4	119.7
2	126.3	116.8	119.9
3	126.4	117.4	120.4
4	124.0	117.7	119.8
1971	124.5	113.8	117.3
1	120.9	112.5	115.3
2	125.2	113.2	117.2
3	125.7	113.7	117.7
4	126.3	115.6	119.1
1970	119.2	110.6	113.5
1969	116.6	110.0	112.2
1968	113.7	107.2	109.3
1967	110.8	101.1	104.3
1966	108.4	98.9	102.0
1962	100.6	99.6	100.0

TABLE 5. FARMERS' CURRENT EXPENDITURES FOR ENERGY, ENERGY PRICE INDEXES AND REAL EXPENSES FOR CANADA, 1962-1973

(thousands of dollars)

	Fuel and Oil			Electricity & Telephone		
Year	Current[1] Expenses —dollars—	Petroleum[2] Index —1961 = 100—	Adjusted Expenses —1961 dollars—	Current[1] Expenses —dollars—	Electricity[2] Price Index —1961 = 100—	Adjusted Expenses —1961 dollars—
1974	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1973	314,558	127.5	246,712	51,489	122.1	42,170
1972	282,425	120.0	235,354	51,011	114.1	44,707
1971	269,070	117.3	229,386	50,799	113.9	44,600
1967-71	254,641	111.1	228,722	49,968	106.6	46,888
1962-66	212,549	100.8	210,921	41,181	98.5	41,815

[1] Farm Net Income, Cat. No. 21-202, Annual, Statistics Canada.
[2] Prices and Price Indexes, Cat. No. 62-002, Monthly, Statistics Canada.

phone have been increasing, but when these are expressed in constant dollars the trend is reversed, that is, expenditure has been declining in real terms. No separate data series were available to determine how far the proportions of electricity and telephone expenses within the total expenditures for electricity and telephone have changed.

The data in Table 6 indicate that the electrical energy industry in Canada has been supplying electricity demands adequately. The data for the first two quarters of 1974 compare quite favorably with the same period of the preceding years. Furthermore, exports to the U.S. have been increasing.

OIL PRICING SUPPLIES AND POLICIES IN CANADA

Refineries east of the Ottawa River Valley are supplied with crude oil imported from foreign producers, while the refineries to the west of "the Ottawa Valley line" are

TABLE 6. ELECTRIC ENERGY AVAILABLE BY PROVINCES, 1962-66, 1967-71 AND 1972-74 BY QUARTERS

Year	Atlantic Provinces	Quebec	Ontario	Prairies	British Columbia	Canada[1]	Net Exports
1974			— million kilowatt hours —				
1st quarter	4,986	24,804	23,614	9,204	8,850	71,623	4,049
2nd quarter	4,537	21,585	20,966	7,652	8,081	62,960	3,355
3rd quarter	Not available						
4th quarter	Not available						
1973							
1st quarter	4,376	21,848	22,157	8,302	8,569	65,867	3,446
2nd quarter	4,038	19,586	19,813	7,142	7,859	58,577	3,981
3rd quarter	3,972	18,244	19,614	7,167	7,688	56,818	4,152
4th quarter	4,577	22,286	22,188	8,765	8,777	66,751	3,138
TOTAL	16,963	81,964	83,772	31,376	32,893	248,013	14,717
1972							
1st quarter	4,046	19,934	20,848	7,803	7,918	60,694	1,338
2nd quarter	3,665	18,066	18,420	6,367	7,279	53,922	2,499
3rd quarter	3,211	17,665	18,168	6,417	6,903	52,480	2,212
4th quarter	4,263	20,496	21,423	7,927	8,341	62,596	1,887
TOTAL	15,185	76,161	78,859	28,514	30,441	229,692	7,936
5-yr Av 1967-71	11,697	64,790	64,942	21,573	25,110	188,518	1,809
5-yr Av 1962-66	7,160	49,441	46,065	13,672	17,200	133,781	891

[1] Includes Yukon and Northwest Territories

supplied with Canadian-produced crude oil from Alberta and Saskatchewan. Alberta and Saskatchewan also export crude oil to the United States. To prevent inequities created by the Middle East oil embargo and price increases in the fall of 1973, the Federal Government introduced an "Oil Compensation Program". The price of Alberta crude oil used in Canada was fixed at $6.50 a barrel at the wellhead for a specified period. The producers receive about $1.92 a barrel, the Provincial Government collects $3.15, while the Federal Government collects $1.43 a barrel. On any oil exported from Alberta or Saskatchewan to the United States, the producer receives $1.92 a barrel, the Provincial Government $3.15, but the Federal Government collects $6.63 a barrel, including the export tax. For Canadian crude used in Canada, 70 percent of the domestic price is decided politically; for exported Canadian crude, 84 percent of the export price is the result of political decisions. A subsidy is paid to the importer on any oil imported into Eastern Canada. The subsidy is the difference between the world price and the fixed wellhead price of $6.50, less the cost of transporting Alberta crude oil to Montreal.

As long as Canada exports more crude oil than it imports, the revenues collected from the export tax on Western crude cover the cost of subsidies paid to Eastern importers. At present, 900,000 barrels a day are imported into Canada, while 910,000 barrels a day are being exported. Hence, the cost of the subsidy to the government is currently less than its revenues by at least $47,000 a day. But once imports exceed exports, there would not be sufficient revenue generated by the export tax to subsidize Eastern consumers in full.

Turning to supplies, according to the National Energy Board (NEB), Eastern Canada can reasonably count on imports as the major source of its oil supply. This is based on several factors, including: (1) the recently established international energy coordinating group which plans to arrange for the sharing of oil supplies during periods of shortage; (2) the demonstrated ability to move oil into Eastern Canada from the West in a crisis (approximately 115,000 barrels a day can be moved to eastern refiners from Vancouver via the Panama Canal with an additional 1,000,000 barrels a day moving down the St. Lawrence as long as the shipping lanes are open); and (3) the proposed Sarnia to Montreal pipeline which would move 250,000 barrels a day to Montreal. Oil needs east of the Ottawa Valley line will be 885,000 barrels a day in 1975. These needs will be filled mainly by imported crude oil from Venezuela and the Middle East, together with 50,000 barrels a day from Western Canada via the Panama Canal.

So far as the requirement for indigenous crude oil is concerned, the NEB has estimated a figure of 1,205,000 barrels a day in 1975, including an allowance of 250,000 barrels a day for Eastern Canada. This demand is expected to grow at an average rate of 3.2 percent a year over the next 20 years, reaching 2,270,000 barrels a day by 1995. The total productability of indigenous crude oil in 1975 will be 2,100,000 barrels a day, declining to some 1,400,000 barrels a day by the latter half of the 1980's. By the early 1980's there will no longer be sufficient supplies of indigenous oil to meet requirements in the market served by this source of supply.

Under the Federal Government's new oil policy, announced on November 22, 1974, oil exports are to be phased out if forecasts of supply and demand indicate that surpluses will disappear in less than 10 years. The outlook is such that expeditious action to reduce crude oil exports is now required. Accordingly, Canadian crude oil exports to the U.S. are to be phased out entirely by 1983. The maximum permitted level of oil exports to the U.S. will fall to 800,000 barrels a day in January, compared with 973,000 in December 1974 and an average of 900,000 up to mid-November 1974. There will be a further reduction to 650,000 barrels a day on July 1, 1975, provided the producing provinces concur. Further reductions scheduled from 1977 onwards will eliminate exports by the end of 1983. The new policy is expected to extend self-sufficiency in the Canadian market west of the Ottawa Valley line by 1.7 years to the end of 1983. It also provides for 250,000 barrels a day into the Sarnia-Montreal pipeline. But Canada will become a net importer of oil sometime in 1975.

Domestic self-sufficiency will occur after 1983 only if production from new sources, such as the Alberta tar sands or Arctic fields, grows rapidly enough to exceed the predicted decline in production from existing reserves. In the opinion of the NEB, given sufficient lead-time and proper economic incentives, there is a good prospect that Canada could become self-sufficient in energy for a long period.

Some increase in oil prices is to be expected in the years ahead. In particular, prices of Canadian crude are likely to move up, removing the current differential of some $5 a barrel between world prices and Canadian prices. Such an increase will become necessary as exports are run down (unless the Federal Government is prepared to subsidize consumers in Eastern Canada out of general revenues), to encourage exploration for new reserves and the tapping of expensive reserves in the tar sands and the Arctic, and in the interests of conservation, reducing or eliminating wasteful use of a non-renewable resource.

However, in the immediate future, it is unlikely that the price for a barrel of Canadian crude will exceed the U.S. "blend" price of $9.20, simply because Canadian firms using petroleum or petroleum products could not compete effectively against U.S. firms producing the same products. A Manitoba wheat grower, for example, would be at a distinct disadvantage to his neighbor in North Dakota, where both are producing identical crops using the same methods. If Canadian gasoline and fertilizer producers are required to pay 26 percent (.26 = ($11.60 - 9.20)/($9.20) more for crude oil, the cost of producing grain and livestock products in Canada would be significantly higher than in the U.S.

ELECTRICITY SITUATION AND OUTLOOK

Electric utility companies are presently facing production cost increases in four areas: (1) increased investment and replacement costs; (2) increased real costs for expansion; (3) increased financing costs; and (4) increased fuel costs.

The prices of electrical production equipment such as generators, dispersion transformers and transmission towers, have been increasing during the last half of 1974 at the rate of $1^1/_2$ percent a month, or 21 percent a year. Recent cost estimates for complete power installation projects have been as much as 32 percent higher than a year ago when their costs were first estimated. Not only have labor and equipment costs risen, but contractors are being forced to bid much more conservatively in an attempt to hedge against inflation. Delivery times on equipment orders have been extended two to three times in many instances. The way that electricity generation capacity is developed, especially hydroelectric installations, is that the cheapest sites are developed first, then the next cheapest site, and so forth. For example, in Quebec, the first hydroelectric installations were relatively close to Montreal. More recently, the James Bay project, 600 miles north of Montreal, is being developed. This means that more and more miles of transmission lines are needed to deliver a kilowatt of electricity to the consumer. Also, more intricate and complicated dams or powerhouses are needed. That is, even without recent price inflation, the real investment per kilowatt hour produced is increasing. However, with the recent price inflation, not only have the real costs per kilowatt hour increased, but this additional capital also costs more dollars per unit. There have been technological developments which offset some of these real costs, but there is a limit to such offset, and this has been reached with current technology.

In the area of financing costs, electric utilities have been faced with several years of increasing interest rates in bond markets. Interest rates on utility bonds and debentures have risen from 3, 4, and 5 percent levels several years ago to the more recent 8, 9, and 10 percent levels. This not only increases the cost of electricity generated from new installations, but as old issues of utility bonds bearing 3 and 4 percent interest are retired, the average interest cost per kilowatt produced increases. The average cost per kilowatt produced is of particular interest because the rates for electric utility companies have been set so that the company's average cost per kilowatt produced was covered. This sort of rate-setting practice comes from viewing electrical utilities as public services in the same category as hospitals, police and fire departments, military forces, etc., which are supposedly to be provided in a non-profit manner. But this "public service" view is being replaced by one in which a public utility is seen as a business venture where the rate of return on invested capital and the value of existing capital plant and equipment are being considered in the same manner as in other businesses. Thus, more and more electric utilities are basing their arguments and cases for rate increases upon the rate of return using present replacement value, and not actual cost of several years ago. Also, the rate of return on invested capital is being compared with alternative uses of the capital such as mortgages, loans, and company profits; that is, the opportunity cost principle is in effect.

In financing public utilities, such as electricity, there is an increasing tendency to internally finance a larger proportion of new investment in expansion or replacement projects. Instead of 100 percent financing of a project through the issue of interest-bearing bonds and debentures, electric utilities are now striving towards more conventional financing arrangements. By financing a larger proportion of their capital internally, these companies can take advantage of money market fluctuations by selling a larger portion of their bonds when interest rates are lower. Part of the requested rate increases are being used to generate capital for purposes of financing internally some of their operations. These requests are being accepted by regulatory bodies across Canada.

For those areas serviced by fossil fuel thermal generating plants, the outlook is pessimistic. In general, all fossil fuel prices have been increasing and the outlook is for these increases to continue. As fuel prices increase, the cost of generating electricity with fossil fuel generation plants must also rise. This means that rate increases will be more justifiable when these utility companies make applications for raising their rates.

NATURAL GAS

Canada has a large, but largely undefined, natural gas resource base. At the end of 1972, proven marketable reserves were 53 trillion cubic feet and the potential reserves are believed to be many times this total. Eighty-one percent of Canada's natural gas is supplied by Alberta and 14 percent by British Columbia. Canada's natural gas requirements are protected by the National Energy Board which requires that more than 25 times the projected consumption rate four years hence must be held in reserves. Surpluses above this amount may be considered for export to the United States.

At present, two central problems are paramount in the natural gas industry: (1) there is a lack of pipeline transport capacity from the sources, e.g., Alberta, to the major consuming areas, e.g., Ontario and Quebec; and (2) the disparity of the natural gas prices with other fossil fuels. The demands in Eastern Canada are presently at the 579.4 billion cubic feet a year level and are expected to rise. Some natural gas suppliers are already informing their industrial users that they may have to look for other fuel sources in 1976. These cutbacks will occur primarily in the industrial sector because it is easier to convert relatively few industrial users of gas to other energy sources than a multitude of home-owners whose homes and heating systems are incapable of being heated with coal or oil.

During the 1960's, the domestic prices for crude oil were limited primarily by the low prices for imported Middle East crude. As indicated above, the F.O.B. Persian Gulf prices for crude oil were $1.00 a barrel, or about $3.00 a barrel landed in North America in the 1960's. Since then a nearly four-fold price increase has occurred. The result of this is that natural gas wellhead prices are extremely low, at $0.22 per thousand cubic feet. To maintain price parity with crude oil, natural gas wellhead prices would have to be near $0.88 per thousand cubic feet. With the increasing shortage of crude oil, there is also an increase in the demand for natural gas as a substitute for petroleum fuels. Most gas companies will be applying for a rate increase and the gas-producing provinces will be considering raising the royalty rates on natural gas to bring about a parity between natural gas and petroleum fuels.

ENERGY OUTLOOK FOR CANADA

Barring any political crisis in the OPEC countries, there will be sufficient petroleum supplies available to produce and process Canada's agricultural production in 1975. Agriculture has a high priority in the Federal Government's allocation plans, should these become necessary.

Prices of domestically-produced petroleum products may be expected to move closer to world prices, as a consequence of political decisions and the encouragement of exploration for new reserves. As a rule of thumb, a $2 a barrel increase in crude prices would be equivalent to an 8 to 10 cent a gallon increase at the retail level.

Electricity rates may increase 10 to 15 percent a year for several years into the future.

Natural gas rates are expected to increase until they commensurate with petroleum prices. There may be some supply short falls in Eastern Canada by 1976-77 for industrial users, due to a lack of pipeline transport capacity.

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FARM MACHINERY

A surge in the demand for farm machinery has occurred in recent years, and is largely attributed to the increases in the prices of agricultural commodities that have taken place since 1972.

Overall, farm machinery should be more readily available in 1975 than during the past year. However, supplies of the larger equipment sizes are likely to remain tight throughout most of the year, and this is the segment of the market where the demand continues to be the strongest, both in Canada and the United States.

Some further price increases, particularly in this segment of the market, seem likely in 1975.

*P.J. Moore**

INTRODUCTION

To many, the most important single change in resource use in Canadian agriculture during the past 25 years has been the continuing substitution of purchased capital inputs for labor. Between 1947 and 1973 annual farm machinery operating expenses increased almost five times and now amount to more than one billion dollars, or 21 percent of total farm operating expenses. Total investment in farm machinery and equipment on Canadian farms is valued at $4.3 billion, or 15 percent of total capital.

SITUATION

The increasing world requirements for food have placed additional demands on the primary producer for greater production, resulting in a continuing strong demand for most purchased inputs both in the North American and in world markets since 1972. The surge in demand for farm machinery has been of unprecedented proportions. During this time as the North American farmer has been replacing old machinery with new, larger and more productive equipment, industry production of farm machinery has been unable to keep pace with the demand upsurge; inventories held by manufacturers and dealers have almost disappeared, and shortages and lengthy delays in deliveries emerged as common problems for farmers purchasing new machinery.

Contributing to this shift from a buyers' to a sellers' market during 1974 have been the major procurement problems faced by machinery manufacturers for raw materials and purchased components, particularly for items such as steel and tires. Along with hampering production these shortages often resulted in holding back sales for lack of a few essential parts. These same shortages of raw materials and components also delayed production of spare parts for old machinery, a supply which was already under pressure because farmers could not get new machinery.

Most of the farm machinery and parts sold to Canadian farmers is produced in the United States plants of large companies that produce and sell, not only on the North American market, but to some degree on a worldwide basis. While the production mix varies for individual plants and companies, Canadian plants supply about 7 percent of combined Canada-United States sales. At the same time, about 12 percent of the two-country sales takes place in Canada. Canadian farmers' dependence on international trade for farm machinery becomes clearer when it is realized that more than 90 percent of all farm machinery sales in Canada are imported. The United States alone supplies more than 80 percent of the Canadian market. Both of these relationships have been on an upward trend since the early 1960's.

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Within Canada, purchases of new machinery by farmers in the Prairie provinces account for more than half of all purchases of new farm machinery. For some equipment the Prairie market share is much higher. The market share for tractors 80 horsepower and over, is more than 80 percent, 90 percent for pull-type combines and about 75 percent for self-propelled combines. The Atlantic provinces, Ontario and Quebec account for the bulk of the retail trade in small and medium size tractors. More than 60 percent of retail sales in automatic hay balers takes place in the Prairie provinces while sales in Ontario amount to nearly 20 percent of the total market in this implement category.

While the 1974 new farm machinery sales picture was one of shortages and lengthy delays in deliveries, the value of sales for the first eleven months of the year was up by 16 percent over year-earlier levels. Sales of repair parts were up by 30 percent. Tractor and grain combine sales increased by 3 to 4 percent but, in the case of tractors, most of the increase was in the 40 to 80 horsepower sizes, amounting to 12 percent. On a regional basis, farm machinery sales increases varied from a low of 13 percent in Quebec to a high of 21 percent in British Columbia.

The larger than anticipated 1974 sales in farm machinery no doubt contributed to the difficulties manufacturers had in obtaining components from suppliers. This was particularly so for farm implement tires where, along with a world-wide shortage, the situation in Canada was made particularly acute when lengthy labor-management disputes in the Toronto plants of Firestone and Goodyear seriously affected production. However, tire shortages were also due, in part, to the fact that manufacturers were not 'tooled-up' to cope with the sudden increase in orders for farm implement tires. A lead time of about 18 to 24 months is required to increase tire capacity.

The farm machinery manufacturing industry has had difficulty obtaining steel supplies for the past two years. In the early 1970's when steel was more readily available, farm machinery production and sales were low. By the time farm machinery sales were beginning to increase, steel was beginning to be in short supply on a world-wide basis and this led the North American steel companies to place their customers on supply allocations. These allocations were based on previous customer buying patterns and as a consequence, farm machinery companies were penalized because of their lower buying

TABLE 1. CANADA: FARM MACHINERY SALES, PRICES AND FOREIGN TRADE, AVERAGE 1962-66, AVERAGE 1967-71, 1972, 1973 AND JANUARY-SEPTEMBER 1973 AND 1974.

	Unit	Average 1962-66	Average 1967-71	1972	1973	January-September 1973	January-September 1974[p]
Sales[a]							
All New Machines	Mil. $	328.4	352.0	420.2	573.9	415.4	490.4
Repair Parts	Mil. $	52.9	66.7	87.9	107.3	86.3	111.9
Total	Mil. $	381.3	418.7	508.1	681.2	501.7	602.3
Tractors (wheel type)	No.	26,932	21,807	23,508	28,758	20,261	22,400
Grain Combines (SP)	No.	7,323	4,155	2,846	3,930	2,694	3,009
Farm Prices						Third Quarter	
All Machines	1961=100	111.3	130.4	141.4	145.8	145.8	164.4
Repairs[b]	1961=100	106.3	127.5	141.3	145.9	146.1	165.9
Petroleum Products	1961=100	100.7	111.3	120.0	127.5	129.0	151.4
All Inputs	1961=100	110.5	128.5	143.3	166.7	173.3	195.2
Foreign Trade						January-August	
Imports From All Countries	Mil. $	326.5	363.3	490.2	621.9	441.0	572.1
Imports From U.S.	Mil. $	300.0	320.9	420.1	543.1	387.4	500.0
Exports To All Countries	Mil. $	138.2	176.5	216.9	290.3	192.5	257.7
Exports To U.S.	Mil. $	100.3	168.8	204.8	274.0	182.0	242.7

[a]Valued at dealers' buying price before deduction of dealers' cash discounts etc.
[b]Includes tires and batteries
[p]Preliminary

Sources: Statistics Canada (i) *Farm Implement and Equipment Sales,* Cat. No. 63-202 Annual and 63-009 Monthly.
(ii) *Farm Input Price Index,* Cat. No. 62-004 Quarterly.
(iii) *Trade of Canada, Imports by Commodities,* Cat. No. 65-007 and *Exports by Commodities,* Cat. No. 65-004.

pattern of the early 1970's. Shortages were an even greater problem for those manufacturers of machinery and components who had been obtaining their steel from overseas sources and hence did not qualify for quotas. Some of the difficulties in obtaining raw materials in North America are ascribed to the imposition of wage and price controls in the United States. When overseas prices were higher than controlled domestic prices, raw materials were exported.

During the past year some manufacturers claimed to be buying materials at any price in order to keep production up and to provide service for their customers. One reason why manufacturers would be willing to obtain small but essential parts at high prices would be to avoid delaying the sale of the finished machine. Some companies tried to compensate for shortages by tightening up on inventories, especially in the pipeline between divisions. For example, engines made in the U.K. subsidiary of Massey-Ferguson were air freighted to North America instead of being shipped by boat. However, the tight farm machinery supply led to problems of delivery contract prices from suppliers. In August 1974, a news release from the Alberta Department of Agriculture said that suppliers were attempting to rescind delivery contracts with farmers on technicalities. These technicalities included repudiating the authority of their dealers to make binding contracts.

Prices of farm machinery in the fall of 1974 had increased by an average of 13 percent over year-earlier levels. For specific categories of machinery, price increases were 14 percent for tractors, 13 percent for hay balers and 12 percent for grain combines, as based on representative machines. For specific items, price changes would be more or less than these. Although the average rate of price increase for farm machinery during the past year has been about the same as that for all purchased inputs, the major machinery companies made more frequent adjustments in their product prices than has been their practice. In the past, price changes were announced only once a year after the main selling season for the year was ended. Within the past marketing year price changes were announced on four occasions.

As is illustrated in the accompanying chart, sales of farm machinery and equipment are closely related to the economic climate in the farm sector. The surge in the demand for farm machinery in recent years can be largely attributed to the increases in the prices of agricultural commodities that have taken place since 1972. The consequent improvement in farm incomes released a pent-up demand for replacement or larger capacity machinery as farmers had more capital to improve their production capabilities. The factors that underlie the increases in the prices of agricultural

TABLE 2. CANADA: SALES OF SELECTED FARM MACHINERY AND REPAIR PARTS, IN MILLIONS OF DOLLARS AND AS A PERCENTAGE OF TOTAL SALES, 1960-73

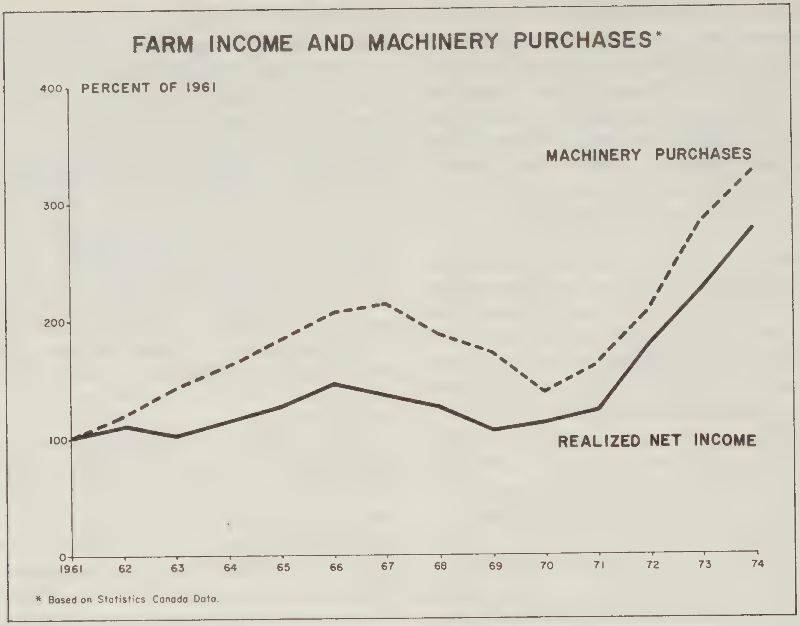
Year	Tractors		Combines		Haying Equipment[1]		Plows[2]		Tillage Machinery[3]		Total Machinery Sales
	Mil. $	Percent of All Sales	Mil. $	Percent of All Sales	Mil. $	Percent of All Sales	Mil. $	Percent of All Sales	Mil. $	Percent of All Sales	Mil. $
1960	78.7	36.2	35.5	16.7	30.5	14.0	11.6	5.3	12.6	5.8	217.5
1961	73.4	36.4	26.3	13.0	29.3	14.5	11.5	5.7	12.9	6.4	201.8
1962	78.3	32.8	43.3	18.1	32.2	13.5	11.2	4.7	15.4	6.4	238.8
1963	94.8	32.9	58.2	20.2	31.4	10.9	12.9	4.5	18.0	6.3	287.8
1964	111.1	34.0	60.2	18.4	30.9	9.5	15.9	4.9	21.1	6.5	326.9
1965	119.7	32.2	81.5	21.9	30.0	8.1	17.2	4.6	23.5	6.3	371.3
1966	145.7	34.9	73.7	17.7	29.8	7.1	19.7	4.7	28.8	6.9	416.9
1967	148.0	34.2	65.5	15.2	29.0	6.7	20.9	4.8	33.8	7.8	432.5
1968	116.7	30.9	56.3	14.9	26.4	7.0	16.0	4.2	28.7	7.6	378.1
1969	107.9	31.3	37.3	10.8	23.2	6.7	10.9	3.1	22.5	6.5	344.3
1970	90.4	32.0	25.9	9.3	21.3	7.6	7.5	2.7	15.3	5.5	279.0
1971	102.8	31.5	36.7	11.2	21.8	6.7	9.5	2.9	19.4	5.9	326.2
1972	151.3	36.0	42.9	10.2	29.7	7.1	11.5	2.7	26.1	6.2	420.2
1973	208.2	36.3	67.2	11.7	41.5	7.2	12.2	2.1	40.8	7.1	573.9

[1] Haying machinery includes: mowers, rakes, conditioners, balers, etc.

[2] Plows include: moldboard, disc plows, diskers, rotary tillers, etc.

[3] Tillage machinery includes: harrows, rotary hoes, pulverizers, cultivators, rod weeders, etc.

Source: Statistics Canada, *Farm Implement and Equipment Sales* (Cat. No. 63-203).



commodities with the resultant surge in the demand for farm machinery are to be found in the developments of the world food situation which has transformed from one of surpluses and low prices to one of relative food scarcity and high prices.

The current tight supply-demand situation for farm machinery is a dramatic turnabout from the excessive inventories of the late 1960's and early 1970's that were held by dealers and manufacturers in both Canada and the United States. The fluctuation in retail sales of farm machinery and equipment that led to this turnabout can be illustrated by examining what happened to tractors (wheel-type). Sales of other types of farm machinery followed much the same pattern as that for tractors.

Combined sales of tractors in Canada and the United States increased steadily during the early 1960's and peaked in 1966. After 1966, sales declined in each of the next five years and reached a low in 1971, 31 percent below the peak sales of 1966. Then in 1972, sales increased by 20 percent. In 1973, sales increased by a further 24 percent. Taking these two years together, unit sales of wheel tractors rose by almost 50 percent over 1971 sales. It is estimated that one out of every five new tractors sold in 1973 was obtained from stocks.[1] By the beginning of 1974 the farm machinery industry no longer had any cushion of inventories from which to draw and as a consequence the bulk of 1974 sales were supplied from current production.

Unit sales of farm machinery are one measure of the increased capitalization of Canadian agriculture. There is also a trend to bigger, more productive and more expensive farm equipment. In 1965, tractors in the size range 80 horsepower and over represented about 24 percent of all farm wheel tractors sold in Canada. By 1973, this size of tractor made up 38 percent of the market. Today's tractors are also designed for greater operator comfort, convenience and safety. Heated and air-conditioned cabs incorporating roll-over protection are becoming common. Hydraulic systems have been improved and their applications extended. Power steering and power brakes are now widely used.

OUTLOOK

Since the market for farm machinery is closely related to economic conditions in agriculture, farm cash receipts and realized farm net income have been traditionally utilized as benchmarks in the process of predicting farm machinery sales from the demand side of the equation. Farm machinery sales fluctuated very little over the last 10 years from a ratio of 10 percent of cash receipts. It has also been suggested that changes in farm machinery

[1] Paper presented by D.E. McKee, Deere & Co., at the United States Department of Agriculture Outlook Conference, December 9-12, 1974.

sales in the current year are highly correlated (90 percent) with the change in net farm income the previous year, and it has been observed that an increase of 1 percent in current farm machinery prices was associated with a 1.6 percent decline in total farm machinery sales[2]. However, since these relationships were observed for a period of years when supplies were generally adequate, and unlike the current situation where the availability of farm machinery is restricting sales, the 1975 outlook must focus also on the supply side of the equation. An indication of anticipated marketing trends and of total farm machinery industry performance in 1975 was provided in a recent report entitled "Industry Outlook '75" by the Canadian Farm and Industrial Equipment Institute. This forecast by the Institute is based on replies to a marketing survey of its 22 active members and 34 associate members which annually account for almost 90 percent of total Canadian farm machinery sales.

The responses to the CFIEI survey indicate that 1975 unit sales of most farm machinery items will either show little change or will actually decline from 1974 sales. Unit sales of farm wheel tractors under 80 horsepower which make up 56 percent of the tractor market, are expected to decline 8 percent. Tractors over 80 horsepower are one of a few categories expected to record a modest increase in sales. Sales of pull-type combines are also expected to increase slightly, but marketings of self-propelled units will be down about 5 percent. Sales of conventional balers are also expected to be fewer than in 1974, but supplies of a new large-type baler appear to be plentiful in relation to demand. The survey indicates that most other categories of general farm equipment are forecast to change very little and/or decline in 1975 from 1974 levels.

In general, the CFIEI outlook proceedings indicated that an available supply of farm machinery would remain somewhat below the level of demand in 1975. Certainly, with an estimated increase in net farm incomes for Canadian agriculture in 1974 compared with year-earlier levels, demand for farm machinery is expected to remain firm. Moreover, farm incomes will be aided during the first quarter of 1975 by final payments received for the 1973-74 crop year from the Canadian Wheat Board and through interim payments on 1974-75 crop deliveries up to late November 1974. On the other hand, lower farm incomes in the livestock sector and the large purchases of farm machinery during the past two years are factors that should have a dampening effect on overall retail demand for machinery in Canada.

[2]An Overview of Selected Farm Supply Industries, Unpublished paper by I.F. Furniss, Economics Branch, Agriculture Canada.

In the United States market, demand for farm machinery is expected to moderate in 1975 and problems of material shortages to abate. This latter change will, of course, apply equally to the Canadian outlook. United States net farm income for 1974 was estimated about 16 percent below the record 1973 farm income and this is expected to lead to some easing of demand pressures and to permit a build-up of farm machinery inventory to more normal levels. Some easing of farmers' and ranchers' demand and beginning build-up of inventories is already detectable in the United States in items of equipment primarily associated with the livestock industry, such as forage and feed handling equipment and the smaller utility equipment.

The problems of material shortages which farm machinery manufacturers and their suppliers faced last year are expected to abate this year largely because of the general slowing in the pace of real economic activity that is expected throughout the industrialized world and which should ease the demand for raw materials. For example, the current slackening in the auto market in the United States is making more steel and rubber available to other industries. However, demand for steel in Canada could be inflated over the next six to eight months if customers follow previous patterns for a contract year in the industry by attempting to hedge their inventories against the July 31 contract deadline.

Strikes, last year's other major problem area in the rubber industry, should not be a problem either in 1975. While strikes and production shutdowns can never be ruled out, serious disruptions are not anticipated on either side of the Canada-United States border. Most wage contracts in the U.S. rubber industry do not expire until 1976. Additionally, more farm implement tire manufacturing capacity will become available this year. The rate of pick-up in filling orders will also depend on the continuing level of demand for farm machinery, but in general it seems that the situation is slowly beginning to improve except for larger tire sizes which will continue to be in short supply. In fact, it would seem the larger the tire size, the longer it will take to achieve a supply-demand balance.

Overall, farm machinery should be more readily available in 1975 than during the past year and as the year progresses dealers may again serve as salesmen instead of order takers. But, supplies of the larger sizes of equipment are likely to remain relatively tight throughout most of the year and this is the segment of the market where the demand continues to be strongest, both in Canada and the United States. Some further price increases, particularly in this segment of the farm machinery market, seem likely in 1975.

Other developments during the past year which will have long-run implications for the farm machinery market include the launching of a farm mechanization research and development program by Agriculture Canada. The National Development Research and Evaluation in Agricultural Mechanization (DREAM) Program aims to improve efficiency of production and handling of agricultural crops and to aid the devising of new machinery[3]. The program, which is administered through Agriculture Canada's Engineering Research Service, is being guided by a National Agricultural Engineering committee comprised of representatives from the provincial and federal governments, from universities and from farm machinery manufacturers. The work is carried out by contracting with agencies outside Agriculture Canada such as universities, provinces, institutes and industry.

A joint undertaking by the governments of the three Prairie provinces is responsible for the Agricultural Machinery Institute now under construction at Humboldt, Saskatchewan, and for satellite stations in Manitoba and Alberta at locations that are yet to be announced. The Institute's central testing facility at Humboldt, which is scheduled for completion in September 1975, will perform evaluations of farm machinery, test prototypes, assist manufacturers with development work, promote the standardization of machinery parts, improve safety features and provide the farming public with information.

[3]Mr. Glenn Downing, Director of Agriculture Canada's Engineering Research Service, is also chairman of the Committee which is guiding the program.

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FARM CREDIT

R.S. Rust*

The amount of credit extended to farmers in 1975 is anticipated to increase over that of 1974 since both inflation and a shortage of supply of such inputs as feed, fertilizer, labor and machinery is expected to increase prices.

The amount of the credit increase, however, should be slightly lower than in the previous year.

SITUATION

Few countries publish estimates on yearly credit flows into farming, on the total farm debt, or on related interest rates. While farmers in Europe appear to receive generally less credit than farmers in the United States and Canada, governments have frequently provided an extensive amount of aid in various forms to encourage change and development in agriculture. In Germany, the amount of government aid to farmers decreased from 6.4 billion D. marks in 1970 to 2.7 billion D. marks in 1974. In France, increased emphasis has been put on credit and consequently farm loans outstanding increased from about 72 billion F. francs in 1971 to 92 billion F. francs at the end of 1972. Interest subsidies which decreased in the late 1960's increased after 1970. Low interest real estate and intermediate loans represent 60 percent or more of total debt. The indebtedness of Danish farmers in 1970 was 25,275 million D. kronar and this debt increased by 6.4 percent in 1971 and 5.6 percent in 1972. In recent years in both Switzerland and Ireland there have been small increases in the amount of credit extended to farmers.

While the amount of credit and government aid received by farmers in developing countries is relatively small and seldom mentioned in reports, recent events suggest that financial aid or credit may soon be increased. The recent economic assistance of $8.6 billion to such countries by members of the Organization of Petroleum Exporting Countries (OPEC) and more than $1 billion to the World Bank will not significantly affect farmers even though a small amount of that is to be used to build fertilizer plants and to encourage agricultural development. However, if such assistance is continued, it should lead to a significant increase in credit or other assistance being available to farmers.

In the United States farm investment and debt data (converted to December 31 instead of the reported January 1 base to facilitate comparison with Canada data) indicate that farm investment at the end of 1970, 1972, 1973 and 1974 was approximately $305 billion, $371 billion, $459 billion and $521 billion respectively. Total farm debt for these years was $61 billion, $74 billion, $82 billion and $94 billion respectively. The proportions in real estate debt and non-real estate debt are nearly equal. The ratio of farm debt to total farm investment has decreased from about 20 percent in 1970 to 18 percent in 1974 and is currently similar to the Canadian ratio. Farm investment is expected to increase to $598 billion by the end of 1975 and the estimated farm debt is expected to be about $108 billion. Farm real estate prices increased about 25 percent from March 1973 to March 1974 and are expected to increase a further 15 percent by March 1975.

In Canada for the five-year period 1961-65 credit extended to farmers increased from $1,150 million to

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$1,863 million, a gain of 62 percent. Long-term credit (over 10 years) increased approximately 112 percent, intermediate-term (up to 10 years) 88 percent and short-term (up to 18 months) 46 percent. The resulting outstanding accounts increased from $1,785 million in 1961 to $3,004 million in 1965 and represented an increase in farm indebtedness of 68 percent. Long-term debt increased 94 percent, intermediate-term 65 percent and short-term 48 percent (Table 1). Based on farm investment in real estate, machinery and livestock being equal to 90 percent of total investment, the ratio of total farm debt to investment increased from 12.2 percent in 1961 to 15.7 percent in 1965.

During the five-year period 1966-70 the amount of credit extended to farmers only increased from $2,022 million in 1966 to $2,240 million in 1970, an increase of less than 11 percent. While credit extended did increase to $2,270 million in 1967, the total credit extended was less than this in 1968, 1969 and 1970. Long-term credit extended decreased by about 43 percent, intermediate-term by nearly 12 percent and short-term increased by over 35 percent during the period. In years prior to 1970, long-term credit extended represented a low of 11.3 percent of total credit in 1969 ranging to a high of 17.0 percent in 1966. In 1970, long-term, intermediate-term and short-term represented 8.8 percent, 18.8 percent, and 72.4 percent respectively of all credit extended compared to 15.7 percent, 23.4 percent, and 60.9 percent, respectively in 1965. The major reason for the decrease in total credit extended over the period 1968 to 1970 inclusive and the decrease in the proportion of long-term credit in this period can be almost entirely attributed to the low farm incomes, grain surpluses and a general slowdown in farm development. In 1968, a sharp decrease in FILA loans occurred due to the relatively low interest rate received by banks. Farm

TABLE 1. AMOUNT EXTENDED AND OUTSTANDING TOTALS AND SUB-TOTALS BY LENGTH OF TERM AND PERCENT CHANGE BY PERIODS 1961-65, 1966-70 1971-72 AND PRELIMINARY 1972-73

Year	Total Extended	Long Term	Intermediate Term	Short Term	Total Outstanding	Long Term	Intermediate Term	Short Term
				— millions of dollars —				
1961	1149.6	138.2	231.9	779.5	1785.1	561.7	624.5	598.9
1962	1288.5	149.7	260.3	878.5	2017.8	652.2	684.8	680.8
1963	1460.9	173.1	308.6	979.2	2297.6	762.9	772.9	761.8
1964	1641.7	224.4	354.3	1063.0	2613.3	902.7	882.8	827.8
1965	1862.8	292.6	435.7	1134.5	3004.4	1089.8	1029.0	885.6
				— percent change —				
1961 to 1965	62	111.7	87.9	45.5	68.0	94.0	64.8	47.9
				— millions of dollars —				
1966	2021.7	344.2	476.4	1201.1	3444.2	1327.5	1169.8	946.9
1967	2270.0	378.5	503.1	1388.4	3950.7	1560.1	1300.8	1089.8
1968	2177.2	316.8	311.9	1548.5	4104.8	1713.4	1147.7	1243.7
1969	2168.9	245.7	415.5	1507.7	4424.8	1796.2	1210.9	1417.7
1970	2239.5	196.8	420.2	1622.5	4480.7	1854.3	1179.7	1446.7
				— percent change —				
1966 to 1970	10.8	−42.8	−11.8	35.1	30.1	39.7	0.8	52.8
1971	2640.7	206.0	528.4	1906.3	4714.3	1875.9	1249.5	1588.9
1972	2975.8	231.9	701.3	2042.6	5085.2	1917.6	1431.7	1735.9
				— percent change —				
1971 to 1972	12.7	12.6	32.7	7.1	7.9	2.2	14.6	9.2
Preliminary 1973	3412.9	425.6	761.4	2225.9	5596.6	2133.9	1526.7	1936.0
				— percent change —				
1972 to 1973	14.7	83.5	8.6	9.0	10.0	11.3	6.6	11.5

debt increased from $3,444 million in 1966 to $4,481 million in 1970, an increase of approximately 30 percent. Long-term debt increased approximately 40 percent, intermediate-term by less than 1 percent and short-term by 53 percent during the period. Whereas long-term, intermediate-term and short-term credit in 1970 represented 8.8 percent, 18.8 percent, and 72.4 percent respectively of total credit extended that year, outstanding farm debt by length of term represented 41.4 percent, 26.3 percent and 32.3 percent respectively of total farm debt.

In 1971 improved demand for western grains and the need by many farmers to make purchases delayed by the grain surplus period resulted in a stronger demand for intermediate and short-term credit. The amount extended increased from $2,240 million in 1970 to $2,641 million in 1971, an increase of nearly 18 percent. Long-term credit increased by less than 5 percent but intermediate credit increased by nearly 26 percent and short-term by more than 17 percent. Total farm indebtedness increased from $4,481 million in 1970 to $4,714 million in 1971. The increase in indebtedness by length of term was only 1.2 percent on long-term, 14.6 percent on intermediate-term and 9.8 percent on short-term. At the end of 1971, 39.8 percent of all farm debt was on long-term, 26.5 percent on intermediate-term and 33.7 percent on short-term accounts. The ratio of total farm debt to total farm investment was 17.8 percent.

The total credit extended in 1972 was $2,976 million, an increase of nearly 13 percent over the previous year, (Table 2). Long-term, intermediate-term and short-term credit extended increased by approximately 13 percent, 33 percent, and 7 percent respectively. The proportion extended in the long-term, intermediate-term, and short-term ranges were 7.8 percent, 23.6 percent and 68.6 percent respectively. The amount of outstanding credit increased from $4,714 million in 1971 to $5,085 million in 1972, an increase of just under 8 percent, (Table 3). Long-term, intermediate-term and short-term credit increased by about 2 percent, 15 percent and 9.2 percent respectively. The proportions of total debt by length of term for 1972 were 37.7 percent long-term, 28.2 percent intermediate-term and 34.1 percent short-term.

During 1972, FCC long-term loans increased to $156 million from $110 million the previous year. Provincial credit agencies increased their loaning activity slightly but put a much larger emphasis on guaranteeing loans through banks and other financial institutions. A large proportion of such loans were at a rate of 1 percent above the prime bank rate. While activity in supplying credit by farm supply companies increased, some companies decreased their credit activity. Concern for becoming too deeply involved in credit to farmers was expressed by some firms and the unprofitable interest rate that had been charged on past accounts was noted by some supply companies extending short-term credit. By the end of 1972, it became apparent that continued increases in the amount of credit extended by supply companies were unlikely to occur and that this type of credit would tend to shift to banks. The ratio of farm debt to total farm investment in 1972 was estimated at 18.2 percent, (Table 2).

Credit estimates for 1973 are preliminary and subject to considerable change. Credit data involve at least seven different fiscal years and data on certain major accounts do not become available for up to 18 months after the close of a fiscal year. Current estimates for 1973 indicate that about $3,423 million was extended of which 12.4 percent was in long-term, 22.3 in intermediate-term and 65.3 percent in short-term credit. This represented a swing back to the more normal proportions that had prevailed prior to 1968. Farm Credit Corporation mortgage loans increased from $156 million in 1972 to $333 million in 1973 and represented an increase of 113 percent. Such loans represented 5.2 percent of all loans in 1971 but in 1973 represented 9.7 percent. While several provincial credit agencies, such as Alberta, Saskatchewan and British Columbia increased direct loans to farmers, continued emphasis was given in most provinces to guaranteed or subsidized loans through financial institutions. In most cases, credit to farmers from supply companies either remained similar to 1971 or decreased, with the decrease in some cases being about 20 percent. These decreases together with smaller decreases from several other normal sources of credit were more than compensated for by increases in non-FILA bank loans to farmers. While credit extended to farmers from banks (excluding FILA) was estimated at $1,369 million in 1971 and $1,469 million in 1972, the estimate for 1973 was $1,734 million. In spite of the increases in 1973, non-FILA bank loans are estimated to have only increased as a proportion of total credit extended from all sources by 1 percent over the previous year. When FILA loans were included total bank loans in 1973 amounted to $1,964 million or 57.4 percent of total credit extended by all sources.

The preliminary estimate on farm credit outstanding for 1973 is $5,597 million compared to $5,085 million for 1972. The $1,444 million on long-term accounts of FCC represented nearly 26 percent of total farm debt. Total indebtedness of farmers to all federal sources (FCC, VLA and IDB) represented about 29 percent of total

TABLE 2. ESTIMATED FARM CREDIT EXTENDED, CANADA 1960 AND 1968 TO 1972

Source and Term of Credit	Estimated farm credit extended						Estimated average interest rate 1971	Estimated average interest rate 1972	Percent of credit extended by source 1972
	1960	1968	1969	1970	1971	1972			
	– millions of dollars –						– percent –		
LONG-TERM (more than 10 years)									
Farm Credit Corporation	52.3	205.3	158.0	116.5	109.7	156.0	7.7	6.7	5.2
Veterans' Land Act	19.4	20.1	17.9	10.5	20.6	11.4	7.7	6.7	0.4
Provincial government agencies	37.0	60.4	42.8	42.4	47.2	36.9	3.8	6.2	1.2
Private individuals	7.0	15.0	17.0	20.0	22.0	17.0	7.0	7.0	0.6
Insurance, trust and loan companies	3.0	13.0	7.0	5.0	3.0	5.0	10.7	10.5	0.2
Treasury Branches (Alberta)	1.6	1.0	1.0	0.8	1.7	3.7	8.5	9.0	0.1
Alberta Electrical Co-operatives	2.0	2.0	2.0	1.6	1.8	1.9	3.5	3.5	0.1
Total long-term	122.3	316.8	245.7	196.8	206.0	231.9	6.8	6.8	7.8
INTERMEDIATE-TERM (18 months to 10 years)									
Banks (FILA)	101.9	40.2	142.0	103.0	147.4	177.9	7.0	6.6	6.0
Banks (other than FILA)	–	–	20.0	30.0	55.0	65.0	7.2	8.4	2.2
Private individuals	75.0	130.0	144.0	148.0	146.0	151.0	7.0	6.7	5.1
Supply companies	29.0	35.0	31.0	40.0	51.0	144.3	14.5	14.9	4.8
FCC (loans to farm syndicates)	–	1.7	2.9	1.8	1.9	1.9	6.9	6.2	0.1
Insurance, trust and loan companies	0.5	5.0	7.0	8.0	10.0	27.0	11.0	10.5	0.9
Industrial Development Bank	–	8.4	9.5	9.5	11.4	16.5	9.5	9.5	0.6
Credit Unions	4.0	70.0	40.0	63.0	82.4	90.1	9.1	9.0	3.0
Municipalities (Ontario Tile Drain Act)	1.0	4.3	5.1	5.8	5.9	4.7	4.0	4.0	0.2
Finance companies (cars and trucks)	8.0	15.0	11.0	9.0	13.0	16.0	13.5	11.0	0.5
Treasury Branches (Alberta)	0.3	2.3	3.0	2.1	4.4	6.9	7.5	8.2	0.2
Total intermediate-term	219.7	311.9	415.5	420.2	528.4	701.3	8.3	9.1	23.6
SHORT-TERM (up to 18 months)									
Banks (other than FILA)	302.0	895.0	990.9	1,126.0	1,314.0	1,404.0	8.2	7.8	47.2
Supply companies	237.0	300.0	218.0	203.0	275.0	269.2	15.0	11.0	9.0
Credit Unions	55.0	187.0	116.0	109.0	134.4	163.6	9.4	9.2	5.5
Finance companies (household and personal)	6.0	12.0	13.0	9.0	12.0	14.0	18.0	16.0	0.5
Dealers, stores, etc.	25.0	14.0	12.0	9.0	10.0	10.0	16.0	14.0	0.3
Private individuals	55.0	105.0	115.0	120.0	105.0	104.0	7.0	7.0	3.5
Treasury Branches (Alberta)	8.0	17.1	19.0	22.0	24.7	27.4	7.0	7.0	0.9
Sedco (Saskatchewan)	–	0.6	4.8	0.5	1.2	1.3	9.6	8.4	0.1
Co-operative programs	–	17.3	19.0	24.0	30.0	49.1	9.6	10.4	1.6
Total short-term	688.0	1,548.5	1,507.7	1,622.5	1,906.3	2,042.6	9.3	8.4	68.6
Total all credit	1,030.0	2,177.2	2,168.9	2,239.5	2,640.7	2,975.8	8.9	8.5	100.0

TABLE 3. ESTIMATED FARM CREDIT OUTSTANDING, CANADA 1960 AND 1968 TO 1972

Source and Term of Credit	Estimated farm credit outstanding 1960	1968	1969	1970	1971	1972	Estimated average interest rate 1971	Estimated average interest charge 1971	Estimated average interest rate 1972	Estimated average interest charge 1972	Percent of credit outstanding by source 1972
	— millions of dollars —						per-cent	millions of dollars	per-cent	millions of dollars	per-cent
LONG-TERM (More than 10 years)											
Farm Credit Corporation	158.4	1,036.1	1,111.5	1,154.1	1,182.5	1,229.1	5.9	69.77	6.0	72.30	24.2
Veterans' Land Act	91.2	180.4	167.5	155.9	151.5	147.2	5.8	8.79	6.0	8.83	2.9
Provincial Government agencies	160.0	351.7	372.1	398.1	395.7	404.6	3.9	15.43	4.6	18.61	7.9
Private individuals	31.0	67.0	70.0	75.0	80.0	72.0	6.0	4.80	6.0	4.32	1.4
Insurance, trust and loan companies	12.0	60.0	58.0	54.0	49.0	46.0	9.3	4.56	9.3	4.28	0.9
Treasury Branches (Alberta)	1.2	1.4	1.0	1.9	3.1	5.0	8.9	0.28	9.0	0.45	0.1
Alberta Electrical Co-operatives	19.7	16.8	16.1	15.3	14.1	13.7	3.5	0.49	3.5	0.48	0.3
Total long-term	473.5	1,713.4	1,796.2	1,854.3	1,875.9	1,917.6	5.6	104.12	5.7	109.27	37.7
INTERMEDIATE-TERM (18 months to 10 years)											
Banks (FILA)	178.1	308.5	306.1	296.0	321.0	374.0	7.8	25.04	7.3	27.30	7.4
Banks (other than FILA)	–	–	21.0	30.0	50.0	80.0	8.3	4.15	8.2	6.56	1.6
Private individuals	300.0	510.0	560.0	550.0	540.0	547.0	6.3	34.02	6.4	35.01	10.8
Supply companies	78.0	120.0	134.0	121.0	130.0	185.2	14.5	18.85	14.9	27.59	3.6
FCC (loans to farm syndicates)	–	3.4	4.8	6.1	6.8	6.7	7.7	0.52	7.4	0.50	0.1
Insurance, trust and loan companies	4.0	20.0	18.0	16.0	15.0	32.7	9.7	1.46	9.6	3.14	0.6
Industrial Development Bank	–	23.0	26.0	29.0	34.0	42.0	9.5	3.23	9.2	3.86	0.8
Credit Unions	5.0	125.0	103.0	89.0	104.0	110.0	9.5	9.88	9.3	10.23	2.2
Municipalities (Ontario Tile Drain Act)	4.2	12.9	16.1	19.6	22.8	24.4	4.0	0.91	4.0	0.98	0.5
Finance companies (cars and trucks)	10.0	21.0	18.0	19.0	21.0	23.0	15.0	3.15	11.5	2.64	0.5
Treasury Branches (Alberta)	0.4	3.9	3.9	4.0	4.9	6.7	8.0	0.39	8.2	0.55	0.1
Total intermediate-term	579.7	1,147.7	1,210.9	1,179.7	1,249.5	1,431.7	8.1	101.60	8.3	118.36	28.2
SHORT-TERM (up to 18 months)											
Banks (other than FILA)	241.5	716.0	792.7	880.6	1,006.9	1,116.0	8.8	93.01	7.8	87.05	21.9
Supply companies	178.0	242.0	254.0	230.0	220.0	185.2	15.0	33.00	12.0	22.22	3.6
Credit Unions	45.0	150.0	220.9	181.0	204.0	259.0	9.5	19.38	9.2	23.83	5.1
Finance companies (household & personal)	5.0	10.0	12.0	9.0	10.0	12.0	18.0	1.80	18.0	2.16	0.2
Dealers, stores, etc.	8.5	5.0	6.0	7.0	6.0	8.5	16.0	0.96	15.0	1.28	0.2
Private individuals	44.0	90.0	95.0	95.0	90.0	86.0	7.0	6.30	7.5	6.45	1.7
Treasury Branches (Alberta)	6.0	13.7	17.7	20.5	23.2	28.4	7.5	1.74	7.0	1.99	0.6
Sedco (Saskatchewan)	–	1.7	2.4	5.3	6.8	2.8	9.4	0.64	8.4	0.24	0.1
Co-operative programs	–	12.3	12.0	11.3	16.0	30.4	9.7	1.55	10.6	3.22	0.6
Unpaid taxes	1.8	3.0	5.0	7.0	6.0	7.6	6.0	0.36	6.0	0.46	0.1
Total short-term	529.8	1,243.7	1,417.7	1,446.7	1,588.9	1,735.9	10.0	158.74	8.6	148.90	34.1
Total all credit	1,583.0	4,104.8	4,424.8	4,480.7	4,714.3	5,085.2	7.7	364.46	7.4	376.53	100.0

debt. While a significant change in the proportions by length of term of credit extended took place in 1973, the proportions by term on outstanding debt did not change greatly and demonstrates that indebtedness accounts do not provide a good picture of the changes in the demand and supply of agricultural credit from year to year.

In 1973 prospects for significantly increased farm incomes encouraged very rapid expansion and very extensive use of credit. Increasing interest rates in 1973, extremely high rates in 1974, low returns from beef and poorer crop prospects in 1974 resulted in some slackening of the credit flow into agriculture late in 1974. However, the availability of long-term credit at rates well below inflation rates encouraged the buying of farm land. It is estimated that FCC loans in 1974 were about $400 million and with further substantial increases from provincial credit agencies, the amount of long-term credit will be significantly greater in 1974 than in 1973. While FILA loans were drastically decreased in 1974, the amount of provincially guaranteed loans is believed to have increased. Supply company financing appears to have further decreased and it is probable that loans from private individuals also decreased. Bank loans, on the other hand, appear to have further increased, (Table 4). For 1974, therefore, an increase in total credit to farmers is believed to have occurred but the percent increase is expected to be lower than it was in 1973.

The average interest rate on all farm credit extended in 1971 was 8.9 percent and varied from a weighted average of 6.8 percent on long-term, to 8.3 percent on intermediate-term to 9.3 percent on short-term. The chartered bank prime rate decreased from 7 percent early in the year to 6 percent at the end of the year. On farm debt, the average rate was 7.7 percent, but on long-term, intermediate-term and short-term it was 5.6, 8.1 and 10.0 percent respectively. In 1972 the bank prime rate remained at 6 percent throughout the year. The average rate on all credit extended to farmers in 1972 was 8.5 percent. Long-term, intermediate-term and short-term average rates were 6.8, 9.1 and 8.4 percent respectively and the total interest charges were estimated at $377 million. Average interest rates on long-term, intermediate-term and short-term debt in 1972 were 5.7, 8.3 and 8.6 percent respectively. In 1973 monthly prime rates of chartered banks increased from 6 percent to 9.5 percent. By quarters, the average rates were 6.56, 6.95, 8.66 and 9.35 percent respectively. In 1973 such rates increased to 10.5 percent in April, to 11.0 percent in May, 11.5 percent in July and decreased to 11.0 percent in October, (Table 5).

OUTLOOK

Both price inflation and shortage of supply of inputs are expected to continue to increase feed, fertilizer, labor and machinery prices in 1975 with the result that more credit will be required. High returns from the production of grain, industrial and urban expansion, speculation and the purchase of land for non-agricultural purposes are expected to all contribute to the increase in farm land prices. While there is expected to be a decrease in credit for livestock expansion, banks have indicated that they will endeavor to help producers overcome current problems. Relatively high farm incomes on many farms

TABLE 4. AMOUNTS OUTSTANDING ON FARM ACCOUNTS OF CHARTERED BANKS[a] BY PROVINCE, DECEMBER 1972 AND 1973, AND JUNE 1973 AND 1974

Province	Amount Outstanding December 1972	Amount Outstanding December 1973	Amount Outstanding June 1973	Amount Outstanding June 1974
	– millions of dollars –			
British Columbia	75	94	90	117
Alberta	420	563	488	616
Saskatchewan	314	397	363	402
Manitoba	136	179	150	173
Ontario	505	630	531	610
Quebec	79	96	93	102
New Brunswick	13	15	11	14
Nova Scotia	11	13	11	14
Prince Edward Island	14	16	13	16
Newfoundland	2	2	2	1
Total	1,569	2,005	1,752	2,062

[a]Bank of Canada Review, various issues. Includes FILA but not personal loans to farmers.

TABLE 5. CHARTERED BANKS PRIME BUSINESS LOAN RATES (CENTRAL BANK RATES IN BRACKETS) 1970-74

Month	1970	1971	1972	1973	1974
			– percent –		
January	8.50	7.00 (6.00)	6.00 (4.75)	6.00 (4.75)	9.50 (7.25)
February	8.50	7.00 (5.25)	6.00 (4.75)	6.00 (4.75)	9.50 (7.25)
March	8.50	6.50 (5.25)	6.00 (4.75)	6.00 (4.75)	9.50 (7.25)
April	8.50	6.50 (5.25)	6.00 (4.75)	6.50 (5.25)	10.50 (8.25)
May	8.50	6.50 (5.25)	6.00 (4.75)	7.00 (5.75)	11.00 (8.75)
June	8.50	6.50 (5.25)	6.00 (4.75)	7.75 (6.25)	11.00 (8.75)
July	8.00	6.50 (5.25)	6.00 (4.75)	7.75 (6.25)	11.50 (9.25)
August	8.00	6.50 (5.25)	6.00 (4.75)	8.25 (6.75)	11.50 (9.25)
September	8.00	6.50 (5.25)	6.00 (4.75)	9.00 (7.25)	11.50 (9.25)
October	8.00	6.25 (4.75)	6.00 (4.75)	9.00 (7.25)	11.50 (9.25)
November	7.50	6.00 (4.75)	6.00 (4.75)	9.00 (7.25)	11.00 (8.75)
December	7.50	6.00 (4.75)	6.00 (4.75)	9.50 (7.25)	

Bank of Canada Review.

in both 1973 and 1974 may have decreased the need for credit or may have resulted in non-farm investments at attractive interest rates. On balance, a further increase in the amount of credit extended in 1975 over that of 1974 is expected but the amount of increase should be slightly lower than in the previous year.

The amount of long-term credit extended is expected to increase in 1975. Based on an index of farm land values (1949=100) the Ontario land price index which was 435 in 1970 increased to 507 in 1972 and increased another 108 index points in 1973. In other provinces the index numbers in 1972 were as follows: British Columbia 315, Alberta 285, Saskatchewan 288, Manitoba 230, Quebec 246, New Brunswick 246, Nova Scotia 224 and Prince Edward Island 212. The percent increase in land values between 1972 and 1973 was, British Columbia 15 percent, Alberta 13 percent, Saskatchewan 16 percent, Manitoba 15 percent, Ontario 21 percent, Quebec 21 percent, New Brunswick 14 percent, Nova Scotia 15 percent and Prince Edward Island 18 percent and for Canada 17 percent. Similar increases are believed to have occurred in most provinces in 1974. In 1975, land prices in grain growing regions, individual and urban fringes, will continue to climb while somewhat smaller increases are expected in livestock regions and regions where restrictions on the sale of farm land applies. After a very large increase in the amount of credit extended by FCC in 1973 and 1974, further increases in 1975 are not expected to be large and a slight decrease in the total extended may even occur. However, long-term credit is expected to increase due largely to increased credit availability to farmers through provincial credit programs in Western Canada. The average interest rate on long-term loans is expected to be below 9 percent in 1975.

The amount of intermediate-term credit provided to farmers will depend on any major changes in monetary policies and their effects on prime interest rates. In spite of a decrease in prime rates late in 1974, it is expected that the overall rate for 1975 will remain relatively high. Farm machinery sales are expected to remain about the same as 1974 but more of the credit required for purchases will likely come from banks. Credit from other input suppliers is also expected to decrease and the length of term of credit will tend to further decrease. Credit from private individuals is expected to decline due to higher interest rates that can be obtained in other fields and due to increased availability of credit from government sources. The total amount of intermediate-term credit is expected to remain close to 1974 levels but is expected to decline slightly as a proportion of total credit extended.

While the amount of short-term credit provided in 1975 depends extensively on interest rates and bank policies, a further increase over 1974 levels is expected. It seems doubtful, however, that the increase will be any larger than in 1974 and may be even less. Lower farm incomes in the livestock sector in 1974 and extensive use of credit during the last two years are expected to have some dampening effect on the demand for both intermediate and short-term credit unless interest rates decrease more than are expected.

POLICY AND PROGRAM DEVELOPMENTS

AMENDMENT TO MEAT INSPECTION REGULATIONS

(Under the Meat Inspection Act)

The changes introduced in Section 14 of the Regulations increase the fees charged to plants for meat inspectors who work overtime. For inspectors who work more than eight and a half hours a day or 40 hours a week, or on statutory holidays, the fee is now $15 an hour for veterinary inspectors and $9.70 an hour for primary products inspectors. The previous fees were respectively $13.60 and $7.80. The new fees will be in effect until the end of the year. (Gazette, Feb. 12, 1975. P.C. 1975-173, Jan. 28.)

BEEF LOAF PURCHASE AND SALE

(Under the Agricultural Products Board Act)

This legislation authorized the Agricultural Products Board to buy up to nine million pounds of canned beef loaf and sell it to the Canadian International Development Agency. This has the double purpose of helping to alleviate problems of cow/calf producers and of carrying out Canada's commitment to the World Food Program. (P.C. 1975-59, Jan. 16)

QUEBEC CROP INSURANCE AGREEMENT

(Under the Crop Insurance Act)

By this agreement, which is similar to existing agreements with other provinces, Canada contributes 25 percent of the necessary premiums and reimburses the province for 50 percent of administration costs. Quebec pays 25 percent of premiums and the other half of the administration costs. The producers pay 50 percent of the premiums. The program is effective for the 1974-75 crop year. The agreement is made under the Federal Act and the new Quebec Crop Insurance Act (Bill 20).

The Minister of Agriculture has requested authority to enter into a similar crop-insurance agreement with Newfoundland. (P.C. 1975-226, Feb. 4)

LEGISLATION BEFORE PARLIAMENT

Our last issue listed a number of bills affecting agriculture that were awaiting second or third reading and passage into law. On February 10 the Government introduced Bill C-50, an amendment to the Agricultural Stabilization Act. This Bill, when it becomes law, would change the list of mandatory products, shorten the base period, increase the guaranteed support level, index the support price to reflect changes in production costs, and provide for regional support programs. It would be designed to ensure a stable and more equitable income for farmers. This Bill will be duly summarized in these pages when it becomes law.

FRESH FRUIT AND VEGETABLE REGULATIONS AMENDMENTS

(Under the Canadian Agricultural Products Standards Act)

Most of the amendments were suggested by the fruit and vegetable industry through the Canadian Horticultural Council. Others were proposed by the Department of Agriculture in consultation with the industry. Most of the changes affected grades for fresh carrots, peaches, cucumbers, potatoes and apples.

Carrots:

The amendments ease the requirements for shape, trimming, broken specimens and crown damage for Canada No. 1 grade to accommodate mechanical harvesting and new varieties. Grades now include "Mini" types in Canada No. 1 provided they meet the size requirements: maximum diameter, $^{3}/_{4}$ inch; maximum length, $3^{1}/_{2}$ inches.

Peaches:

The "free from damage" requirement for limbrub and russeting in Canada No. 1 grade is now defined more clearly. Formerly, no insect injury was allowed. Now a limited amount of injury by Plant Bug is permitted. The change was prompted by restrictions on the use of DDT to control the pest.

Cucumbers:

For Canada No. 1 Greenhouse grade, more variation in the size of specimens within a package is now allowed: $^{1}/_{2}$ inch in diameter or $2^{1}/_{2}$ inches in length for Long English cucumbers, and $^{1}/_{2}$ inch in diameter or $1^{1}/_{2}$ inches in length for other types.

Potatoes:

At the request of the potato industry, a small amount of hollow heart is permitted in Canada No. 1, Canada No. 1

Large and Canada No. 2 grades. The affected area must be less than $^1/_4$ inch in length or width and must not be discolored.

Apples:

In Lobo and Wolfe River varieties of apples, the characteristic color requiremnt for Canada Fancy is reduced from 40 percent to 20 percent of the surface area of the apple.

A carton for packing apricots, cherries, crabapples and prunes is added to the list of standard packages. (Gazette, Feb. 12. P.C. 1975-60, Jan. 16)

PUBLICATIONS

Readers: in ordering publications, use the addresses as shown.

ECONOMICS BRANCH

Available from the Economics Communications Unit, Agriculture Canada, Ottawa. K1A 0C5

Grain-Beef Cattle Operations in Saskatchewan. M.M. Sorboe, Pub. No. 74/14.

AGRICULTURE CANADA

Soil Erosion by Wind. Cause, damages, control. Ottawa. 1966, reprinted 1974. 26p. Illus. 23 cm. Paper cover. (Publication 1266). Prepared by a committee who conducted experimental work in the experimental farms of Manitoba, Saskatchewan and Alberta. Cat. No. A53-1266. Free. Distributed by the Information Division.

Growing Strawberries in Eastern Canada. W.L. Putman and A. Hikichi. Ottawa, 1963, revised 1975. 7p. Figures 23cm. Paper cover (Pub. 1174). Cat. No. A53-1174. Free. Distributed by the Information Division.

Livestock on Small Farms. Ottawa, 1969. Revised 1975. 23p. Illus. 23cm. Paper cover. (Pub. 1381). Cat. No. A63-1381. Free. Distributed by the Information Division.

British Columbia Soil Survey Reports. 1974. Soils of the tulameen area of British Columbia, by F.T. Lord and A.J. Green. Ottawa, 163p. Illus. Tables, Fig., maps (1 folded in pocket) 28 cm. Paper cover. Cat. No. A57-423/1974. Free. Distributed by the Information Division.

Canadian Plant Disease Survey. Issued by the Research Branch. Quarterly. 27 cm. Paper cover. Vol. 54, No. 3, September 1974. pp. 65-103. Cat. No. A47-3/54-3. Free. Distributed by the Information Division.

STATISTICS CANADA

Grain Milling Statistics. November, 1974. Bilingual. Cat. No. CS 32-003. 30¢ per copy. $3 per year. Distributed by Information Canada.

Fruit and Vegetable Processing Industries. 1972. Ottawa, 1975. 14p. Tables, 28cm. Paper cover. Bilingual (Annual Census of manufactures). Prepared in the Manufacturing and Primary Industries Division. Cat. No. CS32-218/1972. 70¢ per copy. Distributed by Information Canada.

Field Crop Reporting Calendar, 1975. Cat. No. CS22-002. Free. Distributed by Statistics Canada.

Fruit and Vegetables Crop reports, 1974. No. 10, Fourth estimate of the commercial production of fruit 1974 (1) Bilingual. Cat. No. CS22-003, $1.40 for the series 1974. Available from Information Canada.

PARLIAMENTARY

Western Grain Stabilization Act. (An Act respecting the stabilization of net proceeds from the production and sale of western grain and to amend certain statutes in consequence thereof). First reading, December 4, 1974. (The Minister responsible for the Canadian Wheat Board.) 44p. Cat. No. XB 301-41/1. 65¢ per copy. Available from Information Canada.

FINANCE

Farm Improvement Loans Act, Annual report, 1973. Ottawa. 1974. English text, 16p. Tables. 24cm. Paper cover. Bilingual. Cat. No. F1-4/1973. Free. Available from the Department of Finance.

IN REPLY

The page provided at the back of each issue for expression of readers' opinions was used by several readers of the October issue. Carl Duguay, a graduate student in the Geography Department of York University, Downsview, Ontario, commented on the article, Farm Adjustments Associated with the ARDA Farm Enlargement and Consolidation Program in Nova Scotia: "Interesting in that it provided a good review of the Farm Consolidation program in N.S. There was, however, little analysis of the program's drawbacks, or the reasons why such an innovation did not diffuse throughout all segments of the farming population (i.e. both large and small farm operators)." He suggested a section of the magazine be devoted to research being carried out by both the academic community and various government and business organizations. And he called CFE "a good informative publication." Editorial thanks. The criticism has been passed on to the author.

Maurice Cay, a farmer in Kinistino, Saskatchewan, referring to the October article, Farm Business Financing and Taxation Relationships, wrote that it "enables us to obtain information regarding trends in agriculture not easily available to individuals." Dave Miller, of the Ontario Agricultural College at Guelph, found that the second article, Growing and Feeding Corn Silage in the Prairie Provinces, gave him the figures he needed, and suggested a comparison on a wider basis. A reader in California, Richard E. Bland of Lafayette, wrote that he found the above-mentioned article on Farm Business Financing "very useful." Georges Rousseau, an agrologist from Berthierville, Quebec, wrote in to compliment the authors of the article Marketing Boards and Pricing in Canada from our June issue. He adds that he appreciates articles that deal with current issues the most.

Thank you for taking the time to return this "reply" page. It helps to keep the authors and editors in touch with readers and their requirements.

CORRECTION
Volume 9, Number 6, December 1974, Page 15

The last sentence of the page read "The model is adequate in its present form." In its place please add,

"The model is adequate in its present form for research purpose (e.g., evaluating results of feeding experiments, or assisting in establishing priorities for further experiments, or both). The routine use of such a model by feed mill and feedlot operators, however, requires a much more extensive package of services than that needed for research. The development of capability for such use is needed if the full potential of research results is to be realized at the producer level.[7] This suggests a need for greater involvement of extension agencies (provincial, university, Canfarm) in the kind of research work described in this article.

[7]W. Candler, M. Boehlje, R. Saathoff, Computer Software for Farm Management Extension, Am. J. Agr. Econ. 52(1): pp. 71-80, 1970".

IN REPLY TO AUTHORS AND EDITORS REGARDING FEBRUARY 75 *CANADIAN FARM ECONOMICS*

I have read the following article(s):

(1) Input Substitution and Productivity in Canadian Agriculture
(2) Agricultural Manpower
(3) Fertilizers
(4) Energy
(5) Farm Machinery
(6) Farm Credit

My comments are on article number______ .

This article was: not useful — very useful

1 2 3 4 5 6 7 8 9 10

Because (e.g., The most important economic and social factors were studied. The work was well documented and the conclusions were useful to me).

Beefs Bouquets (Suggestions to authors, publications committee and editors)

My comments may ( ) may not ( ) be used in a future issue of this publication if the editor wishes.

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Please place this sheet in an envelope and address it to:

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VOLUME 10 NUMBER 2 APRIL 1975

CANADIAN FARM ECONOMICS

Dept. of Economics Br.

Agriculture Canada
HON. EUGENE WHELAN, MINISTER — L. DENIS HUDON, DEPUTY MINISTER

Canadian Farm Economics is published bi-monthly by the Economics Branch, Canada Department of Agriculture, Sir John Carling Building, Ottawa, and is based on material prepared by economists of the Economics Branch.

Purpose: To provide current information on agricultural economics for economists, representatives of extension, education, press, agri-business, trade, foreign offices, bio-physical and social science researchers, administrators, librarians and leading farmers.

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Letters from readers: Letters are encouraged and should be addressed to the author or the Managing Editor. Responses . . . comments, suggestions and points of view are important for effective two-way communications. Letters may be used in the following issue of CFE and will be edited prior to publication where necessary.

AN APPROACH TO IDENTIFYING AND LOCATING THE LOW-INCOME FARMER*

Approximate values of five defined components of real farm family income for 1971 have been estimated. The level of aggregation is provincial and national per farm averages. The results obtained are not necessarily applicable to other years.

*D. McClatchy and C. Campbell***

INTRODUCTION

The subject of identifying and locating the low-income farmer is based on two premises:

1. Before government programs intended to improve the level of living of low-income Canadian farmers can be effectively planned, it has to be determined who and where these farmers are.

2. This has not been done in any nation-wide sense, and indeed, cannot be with the data currently available.

Premise 1 above implies that, for effective planning of any program designed to benefit a particular subset of people within society, the target group and its characteristics must be identifiable. In this paper no arguments are offered in support of this assumption; it is regarded as self-evident.

However, an attempt is made to provide some evidence and arguments in support of Premise 2. The general approach taken is:

1. to lay out what factors should, in the authors' judgement, be considered before a farm family is labelled "low-income"; i.e., *to identify the components of "real net farm family income from all sources"* (hereafter **real farm family income*****), and

2. to obtain the best estimate (under the constraints of available data) of each component of the approximate aggregate average real farm family income, for one year (1971), for Canada and for most provinces, to

   a) illustrate the approximate relative importance of each component for all Canadian farmers on average in 1971.

   b) demonstrate that certain individual components of real farm family income, and particularly the component "net farm income", are poor proxies when taken alone, for total real farm family income.

   c) identify the major deficiencies of existing data in terms of their adequacy for identifying and locating low-income Canadian farm-families.

The interest, in this paper, in measuring real farm family income derives solely from the need to identify those

*The views expressed in this paper are those of the authors and not necessarily those of any other employee of Agriculture Canada.

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***Real farm family income, in this paper, represents a single, defined concept. The definition used here does not necessarily coincide with the meaning of the four words used elsewhere.

farm families whose well-being or level of living is low enough to qualify them for public aid programs. It is not necessary (nor is it implied), that the concept of "real income" developed and used here be suitable for taxation or other purposes.

THE COMPONENTS OF REAL FARM FAMILY INCOME

The components of real farm family income that have been included in the estimation here are as follows:

1. real capital gains on farm land;
2. rental value of farm house;
3. value of food and other farm produce consumed by the farm family.
4. off-farm family income; and
5. net farm cash income (after farm expenses and depreciation charges).

The source or method of estimation used is outlined in the next section for each of these components in turn. There is no further attempt to justify the inclusion of the last four components above, or to justify the exclusion of any other conceivable components which might come to the reader's mind. However, recognizing that controversy exists about whether it is appropriate to include changes in "total personal wealth" or "net worth" as part of real income for the purpose of welfare comparisons, the authors have, in the remainder of this section, presented their reasons for including changes in net worth.

Capital Gains–Real Income or Not

The often-quoted remark "farmers live poor and die rich" alludes to the long-observed phenomenon of capital gains on farm land.[1] It also implies that there is no way that the farmer is able to enjoy the benefits of these gains until he sells his asset, a widely-accepted belief. This belief implies that no opportunity exists at present for a farmer to raise a loan (or re-finance) on the basis of his increasing land equity, and to use that loan directly or indirectly for current consumption. It is suggested that some farmers do, however, obtain loans on this basis. Those who do not may not have the opportunity. On the other hand, they may simply not be aware of the opportunity, or alternatively, their personal aversion to debt may cause them to decline to take advantage of it. In the latter case, they would be valuing equity increase ahead of current consumption (with debt increase), at the margin.

Even if it is sometimes true that a farmer is forced to save his capital gains, this automatic provision for retirement reduces or replaces the necessity for him to contribute to life insurance, pension plans, superannuation plans, savings accounts, etc., thus allowing more income from other sources to be used for current consumption.

Futhermore, even though capital gains may be income of a different (deferred) nature, it is still income in the sense that it represents potential consumption. The owner of the asset may at any time liquidate it and enjoy the benefits of the gain (after paying capital gains tax). He may even continue to farm while renting land.

These arguments do not imply that the authors feel that more opportunities should not be made available to farmers to enjoy the benefits of their capital gains before selling the farm, i.e., opportunities that would make the capital gains effectively a more "liquid" form of income.[2] The arguments are intended just to point out that capital gains on assets owned should be regarded as a part of real income for level of living comparisons.

A final consideration relates to whether capital gains should be expressed in nominal or real terms. Huff and Cusack (1) point out that the real gain to the owner is the increase in the physical goods and services that he could purchase from the sale proceeds, at market value, of an asset at one point in time compared to some earlier point. It is especially apparent in times of rapid inflation that money measures of income must be related to a point in time. If income is considered over a period of one year and it is decided that the end of the year is to be the base or reference point in time, income accruing in months prior to that point should be inflated at the rate of inflation (in the consumption goods price index) during those months. If some income is in the form of a salary paid in regular equal increments, then the average inflation over the whole annual salary could be calculated for six months; i.e.,

[1] Huff and Cusack (1) have shown that, over the long-run, farm real estate is the only farm asset to show appreciable long-term real capital gains (see pp. 26, 27). Ablasser (2) presents evidence which suggests that of the two components of "farm real estate", "land" and "buildings", it is only the "land" portion which increases significantly in value over time. Capital gains on off-farm assets are also significant for some farmers as a source of real income.

[2] The authors believe that new types of credit or other programs that would make capital gains on land effectively a more liquid asset for farmers should be given serious consideration.

the whole previous year's salary would be adjusted upward by one half of the current annual rate of inflation.

In such a broad and approximate analysis as the present one, and particularly for years when the rate of inflation is not great, adjusting salary-type income for inflation is not particularly important. However, in the case of capital gains on an asset, the adjustment becomes much more critical and necessary. This is because the adjustment must be made to the total value of the asset, rather than just to the incremental gain, and will therefore be quite large relative to the total amount of the gain. In the analysis that follows, the consumer price index is used to derive estimates of real rates of capital gain on farm land from estimates of nominal rates. No such adjustment for inflation has been made to the estimated monetary values of other sources of income.

SOURCES OF DATA – METHODS OF ESTIMATION

Estimates of Real Capital Gains on Farm Land, 1971

Information on changes in the value of farm real estate in Canada is very incomplete. As a result, the authors had to make several strong assumptions in order to arrive at an estimate of capital gains on farm land in the "example" year, 1971. First, the average rate of gain for 1961-71 was estimated. This 10-year average was then applied to 1971 land value estimates to approximate that year's gain (assuming the 10-year average rate held for 1971).

Basic data were the Statistics Canada 1961 and 1971 census estimates of total value of land and buildings on farms (Appendix Table 3). On the basis of a post-census survey, Statistics Canada also published estimates of "farm buildings values" in 1971 (Appendix Table 4, column (a)), which leaves 1971 "land values" as the residual. Ablasser (2) showed that over the period 1963-67, in the three prairie provinces, the "value of buildings" as a percentage of "value of land and buildings" fell (by about 5 percent in Alberta, 7 percent in Manitoba, 10 percent in Saskatchewan.) In this study it is assumed that value of buildings as a percentage of value of land and buildings was higher by 15 percent in 1961 than in 1971 in every province, as a means of estimating 1961 farm land values (Appendix Table 4).

There is some evidence that the market value of farm real estate (and particularly the land portion) is underestimated in the census data. Certainly, urban-fringe-type farmland will be underestimated to the extent that farmers, in their census responses, followed Statistics Canada's request that they give farm productive values rather than true market values in such cases. In 1966, Ablasser's average per acre values of farm real estate sales for the three prairie provinces were between 21 and 33 percent higher than the values implicit in the census figures. Ablasser also noted that farmland without buildings (but otherwise similar) often sold for a higher price per acre than land with buildings.

It was more important for present purposes to estimate as correctly as possible, the rate of capital gains, than to spend time refining the absolute land value per acre estimate. In this respect the nominal rates of increase (Appendix Table 7) implicit in estimates of land values per acre in 1961 and 1971 (Appendix Table 6) probably agree reasonably well with Ablasser's figures (bare land) of 14 to 20 percent per year over the 1963-67 period for the prairies, since the rates of appreciation were generally much higher in the early sixties than in the late sixties.

After an approximate adjustment to transform these nominal 10-year average rates of gain into real rates (Appendix Table 7) they were applied to 1971 estimates of the value of farm land to arrive at estimates of capital gains accruing on farm land in 1971 (Appendix Table 8). These estimates were further adjusted (Appendix Table 9) to exclude gains accruing to non-farmer owners of farm land, to finally obtain estimates of average real income, per farm operator, from capital gains on farm land in 1971 (Appendix Table 10). The final estimate averaged $1,857 for all Canadian farmers, and ranged from $583 per operator in Nova Scotia (lowest) to $2,632 per operator in B.C. (highest). In view of the crude nature of the data and method of estimation used, these estimates should be regarded as "ball-park" figures only. Consequently, they have been rounded to the estimates appearing in column (d) Table 1, for the purposes of further analysis.

Rental Value of Farm House, 1971

The fair rental value of the farm house constitutes the major portion of the Statistics Canada farm family "income-in-kind" estimates for all provinces (Appendix Table 12). The estimates for this analysis (Table 1, column (a)) are based on a rounding of the Statistics Canada figures. That the market rental value for the average farm house (average location, average condition) in New Brunswick in 1971 was below $50 per month, seems surprising. However, the authors know of no empirical evidence that disputes the Statistics Canada figures.

TABLE I. SOME APPROXIMATE ESTIMATES OF THE ABSOLUTE AND PROPORTIONATE IMPORTANCE OF THE FIVE MAIN COMPONENTS OF FARM FAMILY REAL INCOME: AVERAGE PER FARM, 1971, CANADA AND BY PROVINCE

	(a) Rental value of house		(b) Other Income in kind (mainly food)		(c) Net farm cash expenses after expenses & depreciation		(d) Real capital gains on land		(e) Off-farm income (family)		(f) Total Farm Family income	
	$value	%	$value	%	$ value	%	$ value	%	$ value	%	$ value	%
B.C.	2,500	16	350	2	1,800	12	2,600	17	8,400	54	15,650	100
Alta.	1,150	10	250	2	3,500	31	2,400	21	4,100	36	11,400	100
Sask.	900	8	250	2	5,500	48	2,500	22	2,300	20	11,450	100
Man.	900	9	250	3	4,100	43	1,800	19	2,500	26	9,550	100
Ont.	1,650	15	300	3	1,600	14	1,900	17	5,700	51	11,150	100
Que.	650	8	500	6	2,300	30	700	9	3,600	46	7,750	100
N.B.	600	8	350	5	1,800	25	600	8	3,800	53	7,150	100
N.S.	800	11	350	5	1,300	18	600	8	4,200	58	7,250	100
P.E.I.	900	17	300	6	1,000	19	700	13	2,500	46	5,400	100
CANADA	1,150	11	300	3	3,100	29	1,900	18	4,100	39	10,550	100

Sources: (a) Appendix Table 12 (after rounding)
(b) Appendix Table 12 (after rounding)
(c) Appendix Table 13 (after rounding)
(d) Appendix Table 10 (after rounding)
(e) Appendix Table 11 (after rounding)

Value of Consumption of Food and Other Farm Produce, 1971[3]

Again, rounding of the Statistics Canada figures (Appendix Table 12) has been adopted as the best available estimates. These estimates appear in column (b) of Table 1.

Off-farm Family Income, 1971

As a basis for this component, the information generated by the Statistics Canada 1972 Agriculture Enumerative Survey has been used. Cross checks on these data come from the aggregated data on farm taxfilers and from the Statistics Canada 1971 Consumer Finance Survey. These three data sets appear in Appendix Table 11.

The samples for these data series do not correspond. There will be more than one taxfiler for some farms (partnerships etc.) and other (low-income) farms will file no tax return. Furthermore, in two cases the off-farm income is average per farm family, while in the other, it is average per person (per taxfiler).

Bearing in mind that the farm family series is expected to be generally higher than the individual person series, the figures are reasonably well in line. Roundings of Agriculture Enumerative Survey family off-farm income series have been adopted for the purposes of the present analysis since the basic interest of this study is in the income position of whole farm families. The estimates of off-farm family income appear in column (e) of Table 1.

Net Farm Cash Income (after farm expenses and depreciation charges), 1971

Again, in this case, two sources of information of provincial aggregate averages exist. They are Statistics Canada farm income series estimates, and the aggregated farm taxfiler data (see Appendix Table 13). In this case the correspondence between the two available series is not good. As noted previously, the population samples for the two series do not correspond.[4] Under-reporting of income for tax purposes, and multiple returns per farm (partnerships, etc.) are expected to cause taxfilers' average net farm income to be lower than the estimate derived from the Statistics Canada data. However, the exclusion of low-income farmers who do not file tax returns would be a factor acting in the other direction. Except in the case of P.E.I., where the census estimate appears to be unduly low for 1971, the adopted figures

[3] Included under 'other' farm produce here would be fuel, lumber, wool, hides, etc.

[4] Gellner J. & Davey B. (3) discuss this point in some detail. In addition, there are conceptual differences between the two definitions of "net income" (e.g. in the treatment of depreciation charges, changes in the value of farm inventory, and interfarm sales of produce).

TABLE 2. REALIZED NET FARM INCOME AS A PERCENTAGE OF TOTAL FARM FAMILY REAL INCOME PER FARM, AND FARM CAPITAL ASSETS AS A RATIO TO BOTH THE ABOVE: SOME APPROXIMATE ESTIMATES FOR 1971, CANADA AND BY PROVINCE

	(a)		(b)	(c)	(d)
	Average realized net farm income per farm		Average value of farm capital assets per farm	Ratio of capital farm assets to realized net farm income	Ratio of capital farm assets to total farm family income
	$	% of total family income	$		
B.C.	4,650	30	70,000	15.1	4.5
Alta.	4,900	43	79,000	16.1	6.9
Sask.	4,650	41	64,000	13.8	5.6
Man.	5,250	55	55,000	10.5	5.8
Ont.	3,550	32	80,000	22.5	7.2
Que.	3,450	45	38,000	11.3	5.0
N.B.	2,750	38	37,000	13.5	5.2
N.S.	2,450	34	35,000	14.3	4.8
P.E.I.	2,200	41	36,000	16.4	6.7
CANADA	4,550	43	65,000	14.3	6.2

Sources: a) Table I; sum of cols (a), (b) and (c).
b) (after rounding) Statistics Canada, Census of Agriculture, Cat. #96-701, 1971.
c) Col. (b) ÷ col. (a)
d) Col. (b) ÷ col. (f) of Table I.

(column (c) Table 1) have been based primarily on the census estimates of net farm income (excluding income-in-kind) for 1971.

RESULTS

Estimates of the approximate component proportion of total real farm family income are presented in Table 1 (col. (f)), average per province for 1971.

In 1971, real capital gains on land appear to have contributed, on average, between 8 and 22 percent of real farm family income, depending on the province. The two components of Statistics Canada's realized net farm income, income-in-kind, and net farm cash income after farm expenses and depreciation charges, make up less than 60 percent of average real farm family income in every province, and little more than 35 percent in Ontario and B.C.

The importance of every major component, as a percentage of the total, varies considerably among provinces. This suggests (but does not prove) that the variation in the proportional make-up of real farm family income among the various components, would vary widely among individual farmers. Unfortunately, very little information is available on this as yet, but, if it is true, it follows that a measure of just any one component, or any combination of just two components, is in no way a valid measure of the level of real farm family income as a whole, at the individual farm level.

Some further ratios, calculated directly from the figures in Table 1 and Statistics Canada-based estimates of average "capital (land, buildings, machinery, plant, livestock) asset values per farm", appear in Table 2. Considerable variation, even in provincial aggregate averages, occurs in the ratios of "farm assets" to "real farm family income" and of farm assets to "realized net income from farming". This indicates that a measure of the value of farm capital assets is a very poor proxy measure for both these two other variables.

The Importance of Part-time Farming

Table 1 shows that off-farm income accounted for roughly 40 percent, on average, of total farm family income. This proportion ranged, on average, from 20 percent in Saskatchewan to 58 percent in Nova Scotia.

In addition, the 1971 census shows that about 50 percent of Canadian census-farm operators reported some off-farm work.[5] Presumably, then, the proportion having some sort of off-farm income would be substantially higher than this.[6] However, the fact that there are still many farmers with no significant off-farm

[5] The proportion is about 65 percent for farmers with gross farm sales under $2,500.

[6] Based on the supposition that many farmers with no off-farm wage income received interest, dividends, government transfers, and the like. Eighty-one percent of farm taxfilers in 1971 reported off-farm income of some sort.

income, when the average off-farm income for all farmers is $4,100 and is not less than $2,300 in any province, points again to the dangers of generalizing from average measures.

Bollman (4) presented some evidence, based on the Statistics Canada 1972 Agriculture Enumerative Survey, of the joint distributions of off-farm earnings, and of off-farm income, on the one hand, with "gross farm sales," on the other, for all Canada. As might be expected, in the higher gross farm sales groups, the incidence and value (on average) of off-farm income is lower than in lower gross farm sales groups.

Porteous (5) reported similar findings using farm taxfiler data, with respect to the joint distributions of net farm income and off-farm income, on the one hand, and gross farm income, on the other. As would be expected, net farm income and gross farm income are positively related. Of more interest is the fact that, at least for gross farm incomes of $1 to $5,000 (net farm income approaching $2,000), average off-farm income falls as net farm income rises.

These average figures for all Canada don't give the picture for each province. More importantly, they don't indicate the number of exceptions to the general trend. One can conclude, from Porteous' results, that a farmer with gross farm income of $4,000 is likely to be in a less favorable "total money income" position than a farmer with a $1,000 gross farm income, or one with a $7,000 gross farm income. Perhaps more surprisingly, one can conclude that a farmer with a $1,000 gross farm income is likely to be in an approximately similar total money income position as a farmer with a $15,000-20,000 gross farm income. These figures thus do support the conclusion that farm income (net or gross) is no valid proxy for farm family income. However, the number of farmers with "total money net income" under $3,000 remains a question.

Two existing data sources provide a rough answer to the latter question. They are the 1971 aggregate farm taxfiler data, and the 1971 Consumer Finance Survey. Percentages of all farm families falling in defined "low total net income" classes are given by province in Table 3. If it is assumed that the Consumer Finance Survey figures are typical of all farm families, and if "poor farmers" in 1971 are defined as those with a "total net money income" of under $3,000, then an estimate can be made of the regional distribution of the 30 percent of all Canadian farm families who were "poor" in 1971. The results of this calculation appear in column (c) of Table 3. These estimates do not account for all components of total real farm family income as defined earlier in this paper. For example, the proportion of poor Canadian farm families located in the three prairie provinces (here approching 60 percent) would be less if "capital gains on land" were taken into account.

TABLE 3. ESTIMATES FROM TWO SOURCES OF PERCENT OF ALL FARM FAMILIES WITH TOTAL NET MONEY INCOME BELOW DEFINED LEVELS, CANADA AND BY PROVINCE OR REGION. ALSO, ESTIMATED PERCENT DISTRIBUTION BY REGION OF FARM FAMILIES WITH TOTAL NET MONEY INCOME BELOW $3,000 in 1971

	(a)	(b)	(c)
	% Farm taxfilers with total net (money) income less than $2,500	% Rural farm families with total net (money) income less than $3,000	% of Canadian rural farm families with income less than $3,000
B.C.	27.7	23	4
Alta.	41.3		
Sask.	41.4	35	57
Man.	52.0		
Ont.	34.3	23	20
Que.	29.4	24	14
N.B.	44.8		
N.S.	44.7	31	5
P.E.I.	59.9		
CANADA	39.1	30	100

Sources: a) Statistics Canada, unpublished data, pers. comm.
b) Statistics Canada 1971 Consumer Finance Survey; as quoted by Davey, Hassan and Lu (6, Table 10, p. 24).
c) Calculated from (b) and Appendix Table 1.

SUMMARY AND CONCLUSIONS

A crude method of analysis has been used to estimate the values of five defined components of real farm family income for 1971. The crudeness is unavoidable given the limitations of the data available, particularly with respect to changing agricultural land values. The level of aggregation is provincial and national per farm averages. The results are not necessarily applicable to other years, and do not show the extent of variation in the relative importance of different real income components at the individual farm level.

It seems likely that the method used has overestimated the importance of the capital gains on farm land component in the year 1971 (though not necessarily for

an average year). Furthermore it is probable that the relative importance of the net farm cash income component was lower than average in 1971.

All components are estimated as "pre-tax". To the extent that they are taxed at different rates, the estimated relative importance of each component in a welfare sense will be biased.

In 1971, the proportionate breakdown of average Canadian real farm family income was approximately as follows:

Rental value of house	11 percent	($ 1,150)
Food and other income-in-kind	3 percent	($ 300)
Net farm cash income (after expenses and depreciation)	29 percent	($ 3,100)
Real capital gains on land	18 percent	($ 1,900)
Family off-farm income	39 percent	($ 4,100)
	100 percent	($10,550)

These results can be regarded as approximate only; the objective was to get an estimation of the general picture. Given the above reservations, is is claimed that the exercise and its results are sufficient to underline certain points:

(1) Changes in wealth or net worth should be regarded as part of real income for welfare comparisions, and the empirical significance of capital gains on farm land for the average Canadian farmer appears to be too great for it to be ignored as a component in such measurements.

(2) The majority of Canadian farmers are part-time farmers in the sense that their family income is derived from both on-farm and off-farm sources.[7] Whether generally desirable or not, part-time farming is very much a fact of life in Canadian agriculture. Part-time farming can represent a very efficient utilization of scarce resources in some instances. Eligibility criteria that currently prevent the participation of certain types of part-time farmers in certain existing agricultural programs should perhaps be reconsidered.

(3) The average (all farmers) ratio of net farm income (either including or excluding income-in-kind) to 'real farm family income, for a given year (1971), shows considerable variation among provinces. The variation in the same ratio among individual farmers, and over time, can be expected to be much greater. The same conclusion is reached with respect to the ratio of net farm income to total farm capital assets. Thus, it is concluded that net farm income is a poor proxy for real farm family income. Furthermore, total value of farm capital assets is a poor proxy for net farm income and, therefore, an even poorer proxy for total real farm family income.

The significance of the conclusions of point (3) above may not be immediately apparent to the reader. Supposing that the only farm family income information available is a distribution of net farm income, there is then no way of knowing in fact if there are any (or how many) farm families below any defined poverty line. The situation in this respect would not be improved much if data on the single distributions of each of the other four components of real farm family income were also made available. Only information on a five-way joint distribution would enable these questions to be answered unless it can be shown that there is a reliable correspondence between the sum of the value of some subset of the five components and the value of the whole, thus legitimizing the use of such a proxy measure.

Similarly, suppose a program exists that is intended to improve the lot of low-income farm families, and farmers are included or excluded from participation in that program on the basis of the value of their net farm income or of the value of their farm assets. If there is no strong correspondence between these latter variables and real farm family income, then there is no way that the Canadian taxpayer can be assured that the intended types of people are benefiting from the program.

These considerations lead to a final, fourth conclusion that is relevant to the topic of further data needs:

(4) Obtaining the total number of low-income Canadian farmers would require information on the five-way joint distribution of the five components of real farm family net income. To locate all low-income Canadian farmers would require information on a six-way joint distribution of the aforementioned five farm family income variables and location.

It does appear that the components "value of farm produce consumed in the household" and "fair rental value of farm house" are less important than the others, and may vary somewhat less among individual farmers.

[7] Apart from those few who rent all the land they farm, they are all part-time land speculators, something about which they have little choice.

However, at a minimum, it would seem that policy-makers and program managers should have knowledge of the fourway joint distribution among individual farms of net farm income, capital gains on farm land, family off-farm income and location if they are to effectively formulate and operate programs to improve poor Canadian farmers' level of living.[8]

At present, all that exists is some preliminary or tentative data of a secondary nature on the two-way joint distribution of net farm income and off-farm income. It is to Statistics Canada's credit that they have recognized the deficiency and are exploring ways of overcoming it. It is hoped that this paper will help to lend urgency and direction to decisions about new data collection in this area.

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[8] The most practical way to obtain this four-way joint distribution may be to combine regular geographical survey data on agricultural land value movements (at present not available) with a four-way joint distribution of the individual farm family variables: location, 'net farm income', off-farm family income and acreage owned.

APPENDIX TABLE 1. NUMBERS OF CENSUS FARMS, ALL CANADA AND BY PROVINCE, 1961 AND 1971

	1961	1971
B.C.	19,934	18,400
Alta.	73,212	62,702
Sask.	93,924	76,970
Man.	43,306	34,981
Ont.	121,333	94,722
Que.	95,777	61,257
N.B.	11,786	5,485
N.S.	12,518	6,008
P.E.I.	7,335	4,543
(Maritimes)	(31,639)	(16,036)
CANADA	480,903	366,128

Source: Statistics Canada, Census of Agriculture, Cat. 96-701, 1961 and 1971.

APPENDIX TABLE 2. TOTAL LAND AREA ON FARMS, CANADA AND BY PROVINCE, 1961 AND 1971

(Units: 000 acres)

	1961	1971
B.C.	4,506	5,823
Alta.	47,229	49,506
Sask.	64,415	65,056
Man.	18,169	19,008
Ont.	18,579	15,963
Que.	14,198	10,801
N.B.	2,199	1,339
N.S.	2,230	1,328
P.E.I.	960	775
(Maritimes)	(5,389)	(3,442)
CANADA	172,551	169,668

SOURCE: Statistics Canada, Census of Agriculture, Cat. 96-701, 1961 and 1971.

APPENDIX TABLE 3. TOTAL REPORTED ESTIMATED VALUE OF FARM LAND AND BUILDINGS, CANADA AND BY PROVINCE, 1961 AND 1971

(Units: $000 current)

	1961	1971
B.C.	493,031	1,293,261
Alta.	1,715,367	3,530,252
Sask.	1,856,523	3,868,089
Man.	719,612	1,374,239
Ont.	2,572,303	5,183,419
Que.	1,014,681	1,321,792
N.B.	90,115	106,606
N.S.	89,263	132,233
P.E.I.	52,501	102,091
(Maritimes)	(231,879)	(340,930)
CANADA	8,622,641	16,936,043

Source: Statistics Canada, Census of Agriculture, Cat. 96-701, 1961 and 1971.

APPENDIX TABLE 4. ESTIMATED TOTAL MARKET VALUE OF BUILDINGS ON FARMS (1971), AND LAND AS A PERCENTAGE OF THE COMBINED VALUE OF LAND AND BUILDINGS (1961 AND 1971), CANADA AND BY PROVINCE

	Buildings, 1971	Land value as % of Land & Buildings value	
	$000 (a)	1961 (b)	1971 (c)
B.C.	505,535	45.9	60.9
Alta.	228,723	54.8	69.8
Sask.	887,310	62.1	77.1
Man.	403,187	55.6	70.6
Ont.	2,668,672	33.5	48.5
Que.	738,419	29.1	44.1
N.B.	61,992	26.0	41.0
N.S.	89,588	17.2	32.2
P.E.I.	60,717	25.5	40.5
(Maritimes)	(212,297)	(22.0)	(37.0)
CANADA	6,480,274	46.7	61.7

Sources: (a) Statistics Canada, Advance Bulletin 1971, Census of Agriculture, Cat. 96-735 AA-18 (Based on data from post-census agricultural sample survey).

(b) From (c) assuming that the percentage rose by 15% in each province between 1961 and 1971.

(c) From (a) and Appendix Table 3.

APPENDIX TABLE 5. ESTIMATED TOTAL MARKET VALUE OF LAND ON FARMS, CANADA AND BY PROVINCE, 1961 AND 1971

(Units: $000 current)

	1961	1971
B.C.	226,301	787,726
Alta.	940,021	2,465,398
Sask.	1,152,901	2,980,779
Man.	400,104	971,052
Ont.	861,722	2,514,547
Que.	295,272	583,373
N.B.	23,430	44,614
N.S.	15,353	42,645
P.E.I.	15,483	41,374
(Maritimes)	(51,013)	(128,633)
CANADA	4,026,773	10,455,769

Source: From Appendix Table 3 and Appendix Table 4.

APPENDIX TABLE 6. ESTIMATED AVERAGE VALUE OF FARM LAND PER ACRE, CANADA AND BY PROVINCE, 1961 and 1971

(Units: $ current)

	1961	1971
B.C.	50	135
Alta.	20	50
Sask.	18	46
Man.	22	51
Ont.	46	158
Que.	21	54
N.B.	11	33
N.S.	7	32
P.E.I.	16	53
(Maritimes)	(9)	(37)
CANADA	23	62

Source: From Appendix Table 2 and Appendix Table 5.

APPENDIX TABLE 7. ESTIMATED AVERAGE ANNUAL RATES OF APPRECIATION OF LAND VALUE PER ACRE, NOMINAL AND REAL, CANADA AND BY PROVINCE, 1961 TO 1971

	(a) Nominal (%/ year)	(b) Real (%/ year)
B.C.	11.0	8.1
Alta.	11.0	8.1
Sask.	11.0	8.1
Man.	10.9	8.0
Ont.	11.3	8.4
Que.	11.0	8.1
N.B.	11.2	8.3
N.S.	11.7	8.8
P.E.I.	11.3	8.4
(Maritimes)	(11.5)	(8.6)
CANADA	11.0	8.1

Sources: (a) From Appendix Table 6 (assuming that the non-correspondence of some land parcels as between the two census years will be insignificant for the purposes of this calculation)

(b) From (a) — an approximation only — after adjusting for an average 2.9 percent per year rise in the cost of living index over the 1961-71 period (Statistics Canada, Prices and Price Indices, Cat. 62-002, Jan. 74, Table 8, CPI Canada; 1961 = 100, 1971 = 133.4)

APPENDIX TABLE 8. ESTIMATED VALUE OF REAL CAPITAL GAINS ON FARM LAND, TOTAL AND AVERAGE PER FARM, CANADA AND BY PROVINCE, 1971

	(a) Total ($ 000)	(b) Per Farm ($)
B.C.	63,806	3,468
Alta.	199,697	3,185
Sask.	241,443	3,136
Man.	77,684	2,220
Ont.	211,222	2,230
Que.	47,253	771
N.B.	3,702	673
N.S.	3,753	626
P.E.I.	3,475	772
(Maritimes)	(11,062)	(691)
CANADA	846,917	2,313

Sources: (a) From Appendix Table 5 and Appendix Table 7 (Assumes rate of appreciation in 1971 was equal to the estimated annual average for 1961-71).

(b) From (a) and Appendix Table 1.

APPENDIX TABLE 9. ESTIMATED PROPORTION OF FARMED LAND OWNED BY FARMERS, CANADA AND BY PROVINCE, 1971

	(a) % farm land rented	(b) % farm land rented from non-farmers	(c) % farm land owned by farmers
B.C.	34.4	24.1	75.9
Alta.	35.9	25.1	74.9
Sask.	29.1	20.4	79.6
Man.	26.0	18.2	81.8
Ont.	18.0	12.6	87.4
Que.	7.6	5.3	94.7
N.B.	7.8	5.5	94.5
N.S.	9.9	6.9	93.1
P.E.I.	10.6	7.4	92.6
(Maritimes)	(9.3)	(6.5)	(93.5)
CANADA	28.1	19.7	80.3

Sources: (a) Calculated from Table 31, Statistics Canada, Census of Agriculture 1971, Cat 96-530.

(b) From (a) assuming 70% of rented land is rented from non-farmers, in all provinces.

(c) 100% minus (b).

APPENDIX TABLE 10. ESTIMATED AVERAGE REAL CAPITAL GAINS ON LAND ACCRUING PER FARM OPERATOR, CANADA AND BY PROVINCE, 1971

(Units: $)	
B.C.	2,632
Alta.	2,386
Sask.	2,496
Man.	1,816
Ont.	1,949
Que.	730
N.B.	636
N.S.	583
P.E.I.	715
(Maritimes)	(646)
CANADA	1,857

Source: Appendix Table 9 (c) and Appendix Table 8 (b) (Assuming average value of rented land is same as average value of owned land).

APPENDIX TABLE 11. AVERAGE VALUE OF OFF-FARM INCOME PER FARM 1971, CANADA AND BY PROVINCE: INFORMATION FROM THREE SOURCES COMPARED.

(Units: $)

	Agric. Enumerative Survey: Off-farm income per Farm family (a)	Farm Taxfilers: Off-farm income per Taxfiler (b)	Consumer Finance Survey: Off-farm income per Rural Farm Family (c)
B.C.	8,370	6,009	7,491
Alta.	4,099	3,237	
Sask.	2,325	1,870	3,406 (Alta., Sask., Man.)
Man.	2,457	2,241	
Ont.	5,692	4,273	6,659
Que.	3,638	2,501	4,786
N.B.		3,016	
N.S.		3,517	4,454 (N.B., N.S., P.E.I.)
P.E.I.		1,932	
(Maritimes)	(3,625)		
CANADA	4,086	3,147	4,866

Sources: (a) Statistics Canada, Quarterly Bull. of Agric. Stats. July — Sept. 1973, Cat 21-003, p. 159 and Appendix Table 1.

(b) Statistics Canada, Unpublished data, pers. comm.

(c) Statistics Canada, Consumer Finance Survey 1971; as quoted by Davey, Hassan and Lu (6, Table 12, p. 26)

APPENDIX TABLE 12. AVERAGE VALUE OF INCOME IN KIND PER FARM FAMILY, 1971, CANADA AND BY PROVINCE

(Units: $)

	House Rent	Other (mainly food)	Total
B.C.	2,493	336	2,829
Alta.	1,145	259	1,404
Sask.	872	234	1,106
Man.	919	249	1,168
Ont.	1,632	311	1,943
Que.	656	489	1,145
N.B.	594	343	937
N.S.	774	353	1,127
P.E.I.	887	301	1,188
CANADA	1,157	311	1,468

Source: Statistics Canada, Farm Net Income 1973, Cat. # 21 — 202, Table 2 p. 8; and Appendix Table 1.

APPENDIX TABLE 13. AVERAGE NET FARM CASH INCOME (AFTER FARM EXPENSE AND DEPRECIATION CHARGES) PER FARM, 1971, CANADA AND BY PROVINCE: INFORMATION FROM TWO SOURCES COMPARED.

(Units: $)

	Census estimates: Realized net farm income minus income in kind (per operator) (a)	Farm Taxfilers: Taxable farm income (per taxfiler) (b)
B.C.	1,843	266
Alta.	3,540	1,053
Sask.	5,519	1,941
Man.	4,144	913
Ont.	1,582	1,005
Que.	2,349	1,593
N.B.	1,847	576
N.S.	1,306	520
P.E.I.	32	687
CANADA	3,110	1,237

Sources: (a) Statistics Canada, Farm Net Income 1972, Cat. # 21-202, Table 1, p. 6-7, and Appendix Table 1.

(b) Statistics Canada, Unpublished Data, pers. comm.

FACTORS AFFECTING THE SUPPLY OF HOGS AT THE NATIONAL AND REGIONAL LEVEL

The influence of several key factors on the supply of hogs at the national, regional and provincial levels was estimated. The price of hogs and the cost of feed had important effects on hog production 18 months later. In most cases, the estimated functions provided predictions of hog marketings that have corresponded closely with actual marketings.

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INTRODUCTION

An understanding of the factors that influence changes in the level of hog production is essential for estimating future levels of production and prices. In addition, estimating the effects of government policies on the hog industry requires a knowledge of the factors that affect production decisions. Whether the problem is predicting the future level of production, price and income, the location of production, or analyzing the effects of specific policies or events, quantification of the relationship between production and the factors that affect it is required.

This article presents estimates of the effects of several key variables on the level of hog marketings at the national, regional and provincial levels. A more detailed discussion of the factors that influence hog production, including the theory of hog cycles, may be found in a recent Economics Branch publication.[1] This publication also includes more details on the procedures and results of the study.

THEORIES OF THE HOG CYCLE

Change in the profitability of hog production obviously is a key factor causing changes in the number of hogs produced. The ratio of the price of hogs to the price of corn – the hog-corn ratio – has long been considered a key indicator of the profitability of hog production. The reliability of a hog-feed grain price ratio as an indicator of production costs has decreased, however, as other costs have become relatively more important.

In addition, the hog cycle seems to have a life of its own. At least until recently, feed grain programs in the United States were quite successful in stabilizing the price of corn, with little effect on fluctuations in hog production and prices. Various "self-generation" theories of the hog cycle have been developed to explain this phenomenon. These theories concentrate on the delay between a change in price and producer's response to the change. If, for example, producers were to observe a profitably high price for hogs in time period 1, they would wish to produce more hogs. The hogs would not come to market, however, until some later period when the larger supply would in fact bring a lower price. This lower price would then result in a cutback in production, etc. The delay in response to a change in price is due, not only to biological requirements, but also to other technological and economic factors and to the degree that producers consider that the current change in price (or price-cost ratio) will be permanent.

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[1] Chin, S.B., J.L. Pando, and D.A. West. National and Regional Hog Supply Functions. Economics Branch Publication, No. 74/15, Agriculture Canada, Ottawa, September, 1974. Note that the results for Quebec and the Atlantic region reported in this article differ somewhat from those in 74/15.

As suggested by these theories of the hog cycle, an important problem in supply analysis is determination of the appropriate lags between prices of hogs (and other factors affecting production) and the resulting change in production. Although empirical analysis does little to tell us the correct reasons for the lags observed, the reasons are important in evaluating the possible effects of any government policy on the level of hog production.

FACTORS INFLUENCING HOG SUPPLY

Three factors (variables) were expected to explain most fluctuations in hog marketings. They were (1) the price of hogs, (2) the cost of feed, and (3) the profitability of beef feeding. The level of marketings in any one period was also expected to be related to the level of marketings in the previous period.

The procedure was to apply the statistical technique of regression analysis to semi-annual market data for the period 1961-1972. Additional variables required for the analysis were (1) a variable to account for any differences in production response between the first and second halves of each year, and (2) a trend variable to account for any gradual changes over the 1961-72 period in the relationships studied e.g., a change in the behavior of producers such as would occur as the result of changes in the technology of hog production.

Several alternative formulations of the supply functions were considered. For example, whether producer decisions are influenced more by the ratio of hog and feed prices or by the absolute difference between them is largely an empirical question. The linear formulation,

TABLE 1. THE EFFECT ON HOG MARKETINGS OF CHANGES IN HOG PRICES, GRAIN STOCKS, AND GRAIN PRICES, BY PROVINCE AND REGION[a]

Province or Region	Price of Hogs	Stocks of Grain	Price of Barley	Price of Corn
Canada	.36	.08	–	–
Eastern Canada	.39	–	–	–.18
Ontario	.34	–	–	–.29
Quebec	.49	–	–	–.27
Atlantic	.33	–	–.06	–
British Columbia	.83	–	–.60	–
Western Canada	.40	.19	–	–
Saskatchewan	.51	.32	–	–
Manitoba	.39	.11	–	–
Alberta	.42	.08	–	–

[a]These numbers are supply "elasticities". They are estimates of the percentage change in hog production that would result from a one percent change in the price of hogs, stocks of grain, price of barley, or price of corn, respectively, other factors constant.

which implies that the absolute difference is relatively more important, provided satisfactory results. This formulation also allowed the separate effects of changes in hog and feed costs to be estimated and a non-price measure of feed costs to be used in some regions.

The study was conducted on a regional basis because all the factors that affect hog production could not be included specifically in the analysis. There is a wide range of alternative enterprises and input cost and market situations among regions. As indicated above, in some cases such as feed costs, different measures of a factor were used in different regions. The regional functions, therefore, were expected to be useful for regional outlook and policy analysis and to provide the basis for more accurate analyses at the national level than would be possible with a single national function.[2]

Characteristics of each variable and the results are discussed below. The estimated functions are presented in detail in Appendix 1. The effects of each variable on hog marketings are summarized in Table 1.

Price of Hogs

The price of hogs is a key indicator of the profitability of hog production. Other factors constant, an anticipated increase in the price of hogs would be expected to result in increased production. The relationship is complicated, however, by the lag in production response. As noted above, this lag is due to biological requirements, the physical and economic factors associated with changing the level of production (especially in increasing production) and the way that producers use current prices to formulate expectations about future prices. Because of the reproduction time required for hogs and the lags indicated by data in prices and marketings, a lag of 3 periods (18 months) was expected.

The results indicated that the price of hogs did have an important impact on the number of hogs marketed 18 months later. For Canada as a whole, Eastern Canada and Western Canada, a one percent change in the price of hogs (other factors constant) was found to be associated with about a 0.4 percent change in the number of hogs marketed. Estimates at the provincial level ranged from 0.28 for the Atlantic Region to 0.83 for British Columbia, although the analysis for these two provinces was hindered somewhat by data problems.

[2]The regions used were: (1) Atlantic–Newfoundland, Nova Scotia, Prince Edward Island and New Brunswick; (2) Eastern Canada–Atlantic, Quebec and Ontario; (3) Western Canada–Manitoba, Saskatchewan, Alberta and British Columbia, and (4) each individual province except those in the Atlantic region.

Cost of Feed Grains

The profitability of hog production also depends, of course, on input costs. The major cost item subject to appreciable short-term variation is the cost of feed grain. The appropriate variable for measuring this cost, however, differed among regions. In Ontario, Quebec, and Eastern Canada as a whole, the price of corn was used to measure feed costs, while in the Atlantic Region and British Columbia the price of barley appeared to be more relevant. No price series was available, however, to adequately reflect variations in the cost of barley to hog producers in the Prairie Provinces. Wheat Board prices were not relevant over much of the period because producers of grain (with or without hogs) often could not deliver as much grain as they wished at these prices. At the same time, adequate data on off-board prices could not be obtained for the whole period. The most appropriate available measure of the cost of grain to hog producers, therefore, appeared to be the level of total grain stocks. This variable was used for each prairie province, Western Canada, and Canada as a whole.[3]

The results verify the importance of feed costs in decisions to produce hogs. For Ontario and Quebec, a one percent increase in the price of corn, other factors constant, was estimated to be associated with a 0.3 percent decrease in hog marketings 18 months (3 periods) later. The somewhat lower estimate of about 0.2 percent for Eastern Canada perhaps reflects an averaging out of somewhat different lags in response over the region. The price of feed grain was also a significant variable in the Maritimes and British Columbia.

For Western Canada, each one percent increase in grain stocks was associated with about a 0.2 percent increase in hog production two periods (1 year) later. The importance of this factor differed appreciably among the individual provinces, apparently reflecting the relative degrees of specialization in grain production.

At the national level, neither the level of grain stocks nor price of feed grain were found to influence hog production. This was no doubt due to the fact that stocks of grain were not too relevant in Eastern Canada and the price of feed grain was not too relevant in Western Canada.

[3]The stocks of grain variable was a measure of the stocks of wheat, oats, barley and corn on farms in Canada. The level as of July 31 was used for the first half of the year; the average of stocks as of July 31 of year t and year t+1 were used as the measure for the second half of year t.

Profitability of Beef Feeding

The desire of farmers to produce hogs was expected to be influenced by changes in the relative profitability of other enterprises. The most likely alternative livestock enterprise to be considered by hog producers was beef feeding.[4] The profitability of beef feeding depends not only on the cost of feed but also on the difference between the cost of feeder cattle and the value of fed cattle. Since the cost of feed was already included in the analysis, the measure of beef profitability used was the difference in the value per head of the typical feeder and fed animal, this difference being expressed on a per hundredweight of gain basis.[5]

In this study, the measure of profitability of beef feeding did not significantly affect hog production. This result may have been due in part to the relatively short period allowed for adjustment between enterprises. It also may have been due to inadequacies in the measure of beef profitability employed.

Other Factors

As indicated earlier, the analysis was for semi-annual periods. Marketings were higher in the first half of the year than in the second half in each of the prairie provinces and Canada as a whole, and lower in Quebec. No differences in response to the variables analysed were found between the two halves of the year.

The trend variable was significant only for British Columbia, Eastern Canada and Canada. This variable indicates the effect on hog production of factors not explicitly included in the analysis but associated with time.

IMPORTANCE OF EACH FACTOR

Whether or not any particular variable is considered to be an important factor affecting hog supply often depends not only on the degree to which it would

[4]The major alternative enterprise for many farmers, especially in Western Canada, would be grain production. The grain cost variable discussed in the previous section provided an indicator of the relative profitability of producing grain.

[5]The specific measure used was:

$$C_t = \frac{P_{st} \bullet W_s - P_{ft} \bullet W_f}{W_s - W_f}$$

where P_{st} and P_{ft} are the prices of choice slaughter steers and good feeder steers at time t, respectively, and W_s and W_f are their respective average weights. The weights used were 1,100 pounds for the fed animals and 450 pounds for the feeder animals. The feeder steer price was used in the absence of complete price data for feeder calves. Although this procedure probably did not affect the results greatly, more work is needed on measuring the opportunity cost of beef feeding in the analysis of hog supply.

TABLE 2. PREDICTED AND ACTUAL HOG MARKETINGS FOR THREE PERIODS WITH PREDICTION ACCURACY, BY PROVINCE AND REGION

Location	July-December 1973			January-June 1974			July-December 1974		
	Actual	Predicted	Error	Actual	Predicted	Error	Actual	Predicted	Error
	thousand head		percent	thousand head		percent	thousand head		percent
Ontario	1,340.75	1,368.70	2.1	1,458.84	1,458.31	− 0.0	1,322.03	1,367.00	3.4
Quebec	958.20	999.83	4.3	1,140.79	1,026.00	−10.0	1,148.91	1,083.01	− 5.7
Atlantic	157.30	164.13	4.3	166.93	177.16	6.0	142.74	184.74	29.4
Eastern Canada	2,456.27	2,476.53	0.8	2,766.56	2,761.06	− 0.2	2,613.68	2,611.79	− 0.1
Manitoba	607.98	613.87	0.1	675.64	600.54	−11.1	594.13	588.49	− 1.0
Saskatchewan	494.38	472.02	−4.5	624.81	568.98	− 8.9	409.51	373.12	− 9.0
Alberta	790.61	793.06	0.3	879.75	904.19	2.8	797.94	769.86	− 3.5
British Columbia	25.81	24.95	−3.3	33.16	33.18	0.1	37.83	35.53	− 6.1
Western Canada	1,918.78	1,904.43	−0.8	2,213.36	2,121.98	− 4.1	1,839.41	1,912.22	4.0
Canada[a]	4,375.05	4,380.96	0.1	4,979.92	4,883.04	− 2.0	4,453.09	4,524.01	1.6

[a]The predicted values for Canada are the sum of the predicted values for Eastern and Western Canada as estimated from their respective equations. Predictions for Eastern and Western Canada also could have been made by summing the predictions from their respective sub-regional functions but the results would have been less accurate.

change the level of production if it should change (as discussed above) but also the degree to which it does in fact fluctuate from period-to-period. A change in the incidence of disease or the ability to prevent disease could have a large impact on production, but such changes do not occur with the frequent severity of changes in hog prices, for example.

When both the degree to which the change in a variable would affect production and the degree to which the variable fluctuates were taken into account, the variable affecting hog production the most in each region was the level of marketings in the previous period. The least important in most cases, was the profitability of beef production. Of more interest, however, are the results that (1) for Western Canada and each prairie province except Alberta, fluctuations in grain stocks were more important than fluctuations in hog prices, and (2) for Eastern Canada, Ontario and Quebec, and the Atlantic Region, the price of hogs was somewhat more important than the price of grain.[6]

CONCLUSIONS

This study provides estimates of the influence of several key factors on the supply of hogs at the national, regional and provincial levels. In all cases, the price of hogs had an important effect on hog production 18 months (3 semi-annual periods) later. The cost of feed also influenced significantly the level of hog production; in fact, in Western Canada, Manitoba and Saskatchewan, the level of grain stocks was a more important variable than the price of hogs.

The estimated relationships are useful in the analysis of government livestock and feed-grain policies at the national and regional levels. The estimates can also be used to make short-term predictions of hog production. Predictions made for the periods July-December, 1973, January-June, 1974, and July-December, 1974, at the national and regional levels demonstrate the value of the results for outlook work (Table 2). A complete analysis of most policy or forecasting problems, of course, would require more complete economic models and, in all cases, the results would need to be used in conjunction with other information and the judgement of the analyst.

Any study of this type encounters a number of estimation problems not the least of which are the quantity and quality of data available. However, the results appear to explain well the variations in hog marketings over the period of analysis (1961-72).

Use of the results for future periods requires the assumption that underlying economic and technological relationships affecting production will not change. The unprecedentedly high livestock and feed prices in 1973 and 1974 and recent changes in feed-grain and livestock policies, suggest that the results of this study should be used with care. In fact, work is already underway in the Economics Branch to update the results. Although the process of revising studies of this type is a continuing activity, presentation of the results to date provide an understanding of the basic relationships affecting the supply of hogs at the national, regional and provincial levels.

[6]These measures of the relative importance of the factors affecting hog production are discussed in more detail in Chin et al, Publication 74/15 (See footnote 1).

APPENDIX 1. ESTIMATED HOG SUPPLY FUNCTIONS

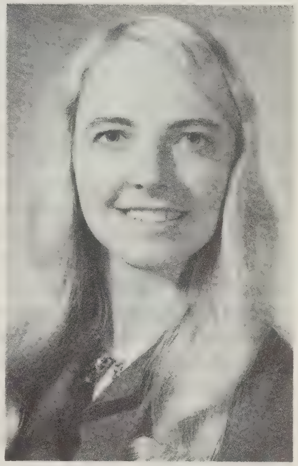
Region	Constant Term	Seasonal Factor	Hog Marketings t-1	Hog Price t-3	Profitability of Beef Feeding t-3	Stocks of Grain t-2	Trend	R^2
Canada	273.404	−214.666	.409	53.321	3.715	.032	24.025	.93
	(.33)	(2.57)	(3.87)	(3.42)	(.16)	(2.42)	(2.92)	
Western Canada	−222.209	−270.951	.530	23.417	7.433	.032	—	.93
	(.96)	(4.14)	(4.31)	(2.26)	(.48)	(3.39)		
Saskatchewan	−120.458	− 63.715	.412	6.118	2.831	.018	—	.94
	(.92)	(3.26)	(3.26)	(2.36)	(.79)	(3.30)		
Manitoba	−130.297	− 50.495	.755	5.545	2.604	.053	—	.95
	(.64)	(2.73)	(7.93)	(1.85)	(.58)	(2.63)		
Alberta	−57.854	−163.076	.591	13.306	2.543	.026	—	.81
	(.41)	(4.85)	(4.27)	(2.40)	(.35)	(2.06)		

Region	Constant Term	Seasonal Factor	Hog Marketings t-1	Hog Price t-3	Profitability of Beef Feeding t-3	Corn Price t-3	Barley Price t-3	Trend t-3	R^2
Eastern Canada	716.705	—	.550	34.770	−13.225	−9.563	—	13.340	.95
	(2.88)		(4.07)	(5.42)	(1.90)	(2.21)		(2.14)	
Ontario	135.815	—	.767	17.217	5.209	−9.172	—	—	.90
	(.57)		(10.15)	(5.06)	(.95)	(4.18)			
Quebec[a]	51.831	51.859	.790	15.685	−2.804	−5.271	—	—	.93
	(.31)	(3.03)	(12.04)	(4.38)	(.60)	(2.55)			
Atlantic[a]	.179	—	.649	1.666	−1.387	—	−.194	1.488	.95
	(.88)		(3.04)	(2.39)	(1.62)		(.42)	(1.40)	
British Columbia	4.89	—	.578	.768	−.125	—	−.335	.311	.94
	(.47)		(4.03)	(4.32)	(.57)		(2.38)	(1.83)	

[a]t-values are in parentheses. A t-value equal to or greater than 1.73 indicates statistical significance at the 95 percent level. These estimates for Quebec and the Atlantic region differ from those presented in Chin et al (see footnote 1).

BUILDING MODELS: AN EXAMPLE FROM THE CANADIAN DAIRY INDUSTRY

Models are tools of the human mind used to explain the known, to visualize the complex, and to predict reality. With the increasing reliability of computers, however, the term model has tended to signify mathematical models. A mathematical model is one or more equations whose solution describes the behavior of a system. The non-stationary Markov model is recommended for the description and explanation of technological change in the dairy industry.



J.C. Nash and N.J. Teeter *

INTRODUCTION

This paper is an attempt to illustrate the process of modelling by means of an example from the dairy industry. Notably, the preconceptions about the system for which a model is being attempted play a more important role in determining the models than the data. A brief discussion is included on a non-stationary Markov model. The authors believe this type of model is not commonly employed in agricultural economics. While this article uses a number of mathematical equations for purposes of explanation, the authors feel that those unfamiliar with these may nonetheless be able to follow the principal portion of the discussion from the text.

MODELS

Models are tools of the human mind used to explain the known, to visualize or simplify the complex, and to predict reality. Most people are familiar with the models used by architects to illustrate their design or by engineers to test their ships, airplanes or other machines. With the increasing power and reliability of computers, however, the term models has tended to signify mathematical models. An attempt will be made to assuage the feelings of anxiety engendered in the majority of people by this term. A mathematical model is simply one or more equations whose solution describes the behavior of a system of interest. The following are two examples:

1. A pipe discharges fluid into a barrel at r gallons/minute.
   Initially there are "g_o" gallons in the barrel. Thus after "t" minutes there will be
   $$g_t = g_o + r.t. \qquad (1.1)$$
   gallons of fluid in the barrel. Equation (1.1) is a mathematical model describing the number of gallons of fluid in the barrel at time "t";
2. "B_o" bacteria in a suitable nutrient start to reproduce. There are "p" percent more bacteria each hour. Thus, at time "t"=1 hour, there are
   $$B_1 = B_0\ (1+p/100) \qquad (1.2)$$

bacteria. At. "t"=2 hours, there are

$$B_2 = B_1\ (1+p/100) = B_o\ (1+p/100)^2 \qquad (1.3)$$

and at "t"=t hours, there are

$$B_t = B_o\ (1+p/100)^t \qquad (1.4)$$

bacteria. Equation (1.4) is a mathematical model of the reproduction of these bacteria.

Equation (1.1) is called a linear or straight line model; Equation (1.4) is an exponential growth model. Often

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the most difficult part of the job of modelling is deciding what kind of equations to use. Another very difficult job is finding or estimating the parameters, e.g., "g_o", "r" in Equation (1.1) and "B_o", "p" in Equation (1.4) that "fit the data". Both these tasks are usually complicated by errors and fluctuations in the data caused by poor or incomplete observation or reporting, sloppy transcribing or arithmetic, or factors not accounted for in the equation, e.g., the weather.

PRODUCTION CHANGES

There is a problem concerning technological change in the dairy industry as reflected in milk production per cow where the goal will be to describe how the production per cow (measured in lb of milk per year), labelled "y_t", changes over time from some starting point "t"=0. A description (and perhaps explanation) is desired of the overall change in production per animal resulting from improved breeds and management practices. Thus, this discussion will be restricted to models that allow "y_t" to be calculated at time "t" without involving other time dependent variables. These simplified models will therefore be open to much criticism, and there will be an attempt to outline briefly those factors of dairy production for which they may or may not be expected to account. The models proposed in the next section have no mechanism to adjust changes in time dependent variables in the real economy, so they cannot be expected to explain the changes in milk production per cow which are responses to alterations in feed costs, milk prices, quotas, or any such market variable. The problem came as a request to extract the time trend in production per cow supposed due to technological change. The intention was to find the effects of various factors other than changes in technology by subtracting the trend from the original data. Thus, the view is taken that the ups and downs of prices (as opposed to prices themselves), while temporarily changing production per cow, do not significantly alter the rate at which new technology is adopted. Here production per cow is used as a measure of the technology change for which there are no statistics conveniently available.

The models may be expected to account for increased production per cow due to the adoption of better breeds[1] and practices such as disease control[2], culling and replacement strategies[3], artificial insemination and bull testing programs[4]. The reasoning used in the above paragraphs should provide a focus for challenges to the models being built since it decides their basic form. It is part of the modellers' job to defend the choices made at this stage of the modelling procedure. This defence will be colored by the purpose for which the model is used, be it to simply summarize data in a few parameters, explain the structure of a system, forecast future values of some variable or other, or all of these.

CANDIDATE MODELS

An attempt must now be made to propose equations that at least describe the changing production per cow. If possible, equations might be used that to some extent explain what is happening. First, an examination will be made of some descriptive models and a criticism of them done on the basis of how well their properties match the expectations of the manner in which changes in technology will express themselves in production per cow. The actual production per cow will be labelled "y_t" (measured in pounds of milk per year) and its model or calculated value, "y" (t).

1. Linear or Straight Line Model

Here, it is expected that at the start it is time "t"=0, with cows averaging "a" pounds of milk per year and each year an increase of "b" pounds of milk per year is obtained. There is no limit on how high production per cow can rise. This is unreasonable in the long term, since biological constraints will force an eventual levelling off. This model is written

$$y(t) = a + bt \quad (3.1)$$

2. Exponential Model

This model uses the shape of the exponential function, and while it has been used in computer programs in the form (3.2) below, it can be expressed equivalently in the form of Equation (1.4). It implies that the percentage increase in production per cow is the same each year, so the absolute increase becomes larger and larger. This equation also has no bound. The parameters "c" and "d" are used in the equation as values that are adjusted to get a fit of the equation to the data.

$$y(t) = \exp(c+dt) \quad (3.2)$$

3. Quadratic Model

The shape of the quadratic function is a parabola, but what it actually looks like depends on the values of the

1. C.A. Brown and J.M. White., Journal of Dairy Science, 56, p. 789, 1973.

2. L.W. Barfoot et al, Canadian Veterinary Journal 12, pp. 2-10, 1971.

3. J.E. Faris, J.A.E., 42, pp. 755-766, 1960.

4. F.W. Dickenson and B.T. McDaniel, Journal of Dairy Science, 52, pp. 1464-1478, 1969.

three parameters "e", "f", and "g" in Equation (3.3). It has considerable flexibility to follow the pattern or shape of the data, but for some time in the future must become unreasonably large or negative. Thus, it will not match the knowledge of reality in the long term.

$$y(t)=e+ft+gt^2 \quad (3.3)$$

4. Logistic Function

If there is an upper and lower limit on production per cow, an S-shaped curve can be obtained from the logistic function. Let the lower limit for production per cow be "h_1", pounds of milk per year and the upper limit be "h_2". Then the following equation can be used,

$$y(t)=h_1+(h_2-h_1)/(1+\exp(-p-qt)), \quad (3.4)$$

to approximately describe the data, where "p" and "q" are the parameters. With the function it is possible to satisfy the condition that production per cow be bounded, but the attempt is still only to obtain a model that describes the data rather than to give some explanation for it. The parameters in each of the four models suggested so far are not obviously or directly related to dairy production (though a deeper analysis might reveal a mechanism linking them to it).

There are two models that attempt to explain the changes in technology. The production technology may be divided into two categories: "old", which does not embody any of the advances in dairy science and management, and "new", which embraces them all. This is a gross simplification and aggregation since it does not allow a separation of the contributions of the various technological advances. However, it is probably adequate to the task of finding the trend in technological change as measured by production per cow. Taking "h_1", pounds of milk per year as the production level for a cow producing under the "old" technology and "h_2" for that of one in the "new" regime, any value of production per cow between these limits may be expressed as a sum of contributions from "old" and "new". Suppose that the fraction of the production per cow which is due to the "old" methods of production is "x_t" in year "t". Then the fraction due to "new" is simply $(1-x_t)$ and the actual production per cow in year "t" is given by the equation

$$y_t = x_t h_1 + (1-x_t) h_2 \quad (3.5)$$

For example, if "h_1" = 3,950 lb/year and "h_2" = 15,000 lb/year

and 50 percent of the cows are in the "old" class (x_t = 1/2), then

$$y_t = 1/2 \times 3{,}950 + (1-1/2) \times 15{,}000$$
$$= 9{,}475 \text{ lb/year}$$

Alternatively Equation (3.5) can be turned around to give the proportion "x_t" of cows producing by "old" technology in terms of the production per cow "y_t" in year "t".

$$x_t = (h_2 - y_t) / (h_2 - h_1) \quad (3.6)$$

Equations (3.5) and (3.6) are not models for technology change since they do not explain how "y_t" or "x_t" changes. They merely transform production per cow figures into figures giving the fraction of production due to the "old" technology. The transformation is dependent on the values chosen for production per cow in each of the technologies.

Two mechanisms are now proposed by which the proportion of production per cow ascribed to the "old" technology can change from year to year. It is expected that it will decline steadily from some starting value near 1 and finish some time in the future with a value near zero; that is, initially the production is almost entirely by means of the "old" methods while in the future it is expected that primarily "new" technology will be used. Consider the possible actions by dairy producers faced with the decision of whether or not to invest time and money in the "new" technology. (The possibility of even "newer" technology is ignored).

Presuming that the "new" technology is always more attractive than the "old", then there is some probability that in any given year "old" technology will be replaced with "new". To make the discussion more concrete, cow replacement can be considered, with "old" and "new" referring only to breed types. A given cow will have a productive life of perhaps four to five years, so it would be expected that a randomly chosen cow would be replaced not more than one year in four or five. Furthermore, there is no certainty that the replacement will be made using a type "new" cow. Consequently, the probability of replacement with a type "new" cow in any one year is at most 1/4 = 0.25. Alternatively, the probability of retaining a type "old" animal is greater than 0.75. This probability will be labelled "r_t" in year "t".

Supposing there is a herd composed of animals of both types. Keeping the herd size constant, the effect of the replacement decision in year "t" is that:

$$\frac{\text{Number of "old" cows in year } (t+1)}{\text{Total number of cows}} \quad (3.7)$$

= (probability of retaining a type "old" cow in year "t,r_t")

$$\times \frac{\text{(number of "old" cows in year "t").}}{\text{Total number of cows}}$$

The number of type "old" cows divided by the total number of cows (in year "t") is the fraction of the technology that is "old" if only breed types are still being considered. This fraction, however, is just "x_t", and the discussion can now be generalized to all of the technological factors and to variable herd size and the equation can be written for the relationship between the proportion of production by "old" technology in years "t"+1 and "t" as

$$x_{t+1} = r_t \, x_t \qquad (3.8)$$

Equation (3.8) is that of a Markov process[5]. Two ways will be considered in which "r_t", the probability that "old" technology is retained, may be expressed. (The probability of retention of "new" is 1, that is, it will be assumed that no one takes a retrograde step).

5. A Stationary Markov Process

The same probability "r_t" will be assumed for all periods "t", that is,

$$x_{t+1} = r \, x_t \qquad (3.9)$$

where the "r" no longer has a subscript "t" to denote its change with time. This model gives a decay of "x_t" from "x_o" to zero asymptotically. The word stationary means the "r" does not change with time.

6. A Non-stationary Markov Process

If it is recognized that initially type "new" accounts for a very small part of the total production, so that it is relatively untried with perhaps limited availability of breeding stock, equipment or expertise, then the probability "r_t" is going to be larger at that point than later. Also, it may be desired that the possibility of resistance to change in human decision making be recognized.[6] It is therefore suggested that the probability of retaining type "old" technology be related to the fraction of production due to type "old" methods and written

$$r_t = u + v \, x_t \qquad (3.10)$$

where "u" and "v" are parameters. This expression can be put into Equation (3.8) to obtain

$$\begin{aligned} x_{t+1} &= (u + v \, x_t) \, x_t \\ &= ux_t + vx_t^2 \end{aligned} \qquad (3.11)$$

5. W. Teller, Introduction to Probability Theory and its Applications, Vol. 1, 2nd Ed., Wiley, N.Y., 1957.

6. E.M. Rogers, Diffusion of Innovations, the Free Press of Glencoe, New York, 1962.

and this can be substituted into

$$y\,(t) = h_2 + (h_1 - h_2)\, x_t \qquad (3.12)$$

to get the calculated production per cow.

Equation (3.11) allows a description and explanation of a band-wagon effect in technological change. The change begins slowly, then picks up rapidly and finally tails off slowly.

The two Markov models are quite different in their appearance (Figure 2), but both share the advantage that they give discrete values for production per cow in accord with the data so that there is no temptation to interpolate to get, for example, semi-annual figures. Both Markov processes need a starting value "x_o" which is a parameter in the model.

THE DATA

The data used in this study fall into five sets:

1. Statistics Canada figures for total dairy production for each province (except Newfoundland) and Canada is divided by that for their estimate of the total number of "milk cows". This is generally regarded as unreliable due to difficulties in obtaining information and uncertainties as to what proportion of "milk cows" are actually milked.

2. Unpublished Statistics Canada data from dairy correspondents' reports give a mean per cow per day production for all cows in herds for which a response was received and

3. a mean per cow per day for all cows actually milking in these herds. These figures are converted to yearly figures by multiplying by 365 and a simple average of the 12 monthly figures is calculated.

4. Dairy Herd Improvement Associations record monthly production for cows belonging to their members. The method of computing and recording production varies slightly from province to province, and there are no figures for Canada as a whole.

5. Canadian Record of Performance is a program sponsored by Agriculture Canada to provide a milk testing service in purebred herds. Average milk production performance for each breed is compared by province at the 305 day level. Since R.O.P. reports production by purebred, breed classification only, a composite of production of all breeds was calculated.

There are 49 data sets in all to consider. If some of these are plotted there is a general upward trend noted but no very distinct features.

FITTING THE MODELS

There are now some candidate models and some data to which to fit them. For each model and data set an appropriate set of parameters is sought which in some way cause the model to best approximate the data. A common criterion for calculating the parameters is to require that they cause the equation to fit the data in the following least squares sense. The actual production per cow in year "t" is "y_t" and the value calculated from the model is "y" (t). The deviation between these

$$y_t - y(t)$$

may be positive or negative. Square this to get the positive number

$$(y_t - y(t))^2.$$

Then add these squared deivations for each year "t" together to get a sum of squares, which is minimized by appropriate adjustment of the parameters. Computer programs to carry out this task are still under a great deal of research.[7]

There remain some further loose ends to tie up. First, three of the models require lower and upper bounds for milk production per cow. The lower bound was found by looking for the smallest value of production per cow in all data sets and all years. This was 4,000 pounds a year in Saskatchewan in 1950. In order to have the data always above rock-bottom, the lower bound "h_1" was chosen to be 3,950 pounds a year. The choice of upper bound was more difficult. While some cows are currently producing better than 30,000 pounds a year,[8] it does not seem reasonable that in industrial as compared to experimental conditions this is at all a realistic bound. After some deliberation "h_2" = 15,000 pounds a year was settled on. The computer programs were developed and tested with 16,000 pounds a year, but after some

7. See for instance, Meyer and Roth, J. Journal of the Institute of Mathematics and its Applications, Volume 9, pp. 218-233, London, 1972.

8. Canadian Record of Performance for Purebred Dairy Cattle, Summary Report, 1973, Agriculture Canada, June 1974.

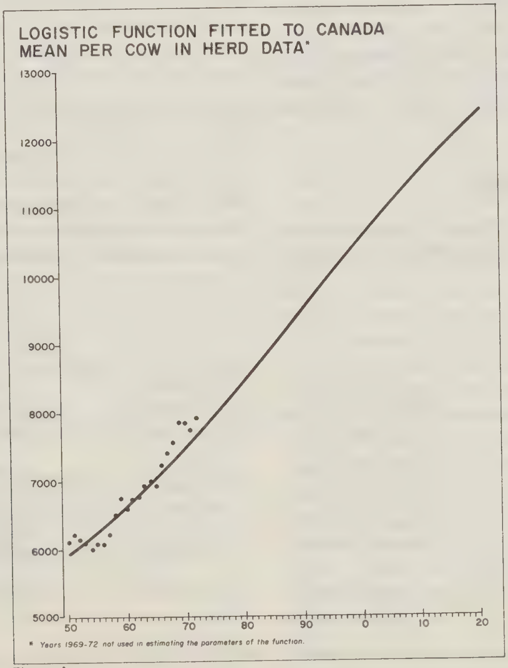

Figure 1

discussions this was reduced to the value above). These figures are based on the authors' judgement and experience since they are bounds and therefore constraints on the model rather than parameters within it. Their experience indicates that the models are relatively insensitive to these bounds.

Only one value has been used for the upper bound on production per cow in all the computations despite the fact this cannot ultimately be correct in view of the different ways in which the data has been gathered and transformed. It is not expected that the procedure for extracting deviations from the time trend will be excessively sensitive to the upper bound chosen since the data seem mainly to indicate that widespread adoption of "new" technology is just beginning (see the next paragraph). In fact, the only inference about the upper bound which may be drawn from the data is that it must be at least 14,000 pounds a year because Record of Performance figures from B.C. in 1972 are almost at this level.

The second problem concerns the sensitivity of the model parameters to small changes in the data. This occurs mainly because the bulk of the data is for the period when technological innovation is just beginning to have its impact on the industry. For instance, Figure 1 gives a logistic function model and the data to which it was fitted. The points (*) all fall on the lower part of the curve, making the estimates of the parameters highly subject to computer rounding errors – it is like trying to adjust the position of the top of a ladder when holding only the bottom two rungs.

EVALUATING THE MODELS

To compare the models, criteria must be decided on by which they may be judged. The properties of each model will need examination to see how well they agree with the understanding of the reality of which a description is attempted and/or explained, but initially, only the degree of fit between the equations and the data will be observed.

As a first step, the minimum sums of squares (squared deviations) for each model for a given data series may be compared. In order to compare models for a number of data series, all the sums of squares should be scaled to provide some idea of the degree of perfection to which the observed data are explained. A very simple model for any data is given by a single number, that is, the production per cow is constant and fluctuations about this ideal are noted. It is easy to show the best single number, that is, the number "$\bar{y}$" such that the sum of

$$(y_t - \bar{y})^2 \tag{6.1}$$

for all "t" is minimized, and just the mean or average of the "y_t"

$$\bar{y} = (\text{Sum over } \dot{t} \text{ of } y_t)\,/n \tag{6.2}$$

where "n" is the number of points.

Letting "T"=Sum over all "t" of $(y_t - \bar{y})^2$ (6.3)

and "S"=Sum over all "t" of $(y_t - y\,(t))^2$ (6.4)

where "y"(t) is calculated by any model a quantity called "R squared" or "R^2" can be calculated:

$$R^2 = 1 - S/T \tag{6.5}$$

Note that for the model

$$y\,(t) = \bar{y} \tag{6.6}$$

"R^2" is simply "0". If the model is perfect, then all deviations are zero and "R^2" = 1. The statistic "R^2" provides a good measure of how well the model fits the data.

TABLE 1*

MODEL	Average of Largest Deviations	Average of Mean Deviations	Average of RMS Deviations	R^2
	(lb/year)	(lb/year)	(lb/year)	
Linear (Equation (3.1))	748.035 (5)	489.270 (5)	551.958 (4)	0.840856 (4)
Quadratic (Equation (3.3))	655.599 (1)	328.564 (1)	434.914 (1)	0.884225 (1)
Exponential (Equation (3.2))	688.687 (2)	433.910 (3)	499.998 (3)	0.846989 (3)
Logistic (Equation (3.4))	746.022 (4)	488.681 (4)	599.239 (5)	0.834775 (5)
Stationary Markov Process (Equations (3.5) & (3.9))	876.943 (6)	597.835 (6)	643.530 (6)	0.829494 (6)
Non-stationary Markov Process (Equations (3.5) & (3.11))	704.522 (3)	360.130 (2)	471.727 (2)	0.882407 (2)

*The figure in brackets behind each entry is the ranking of a given model according to the criterion specified by the column label.

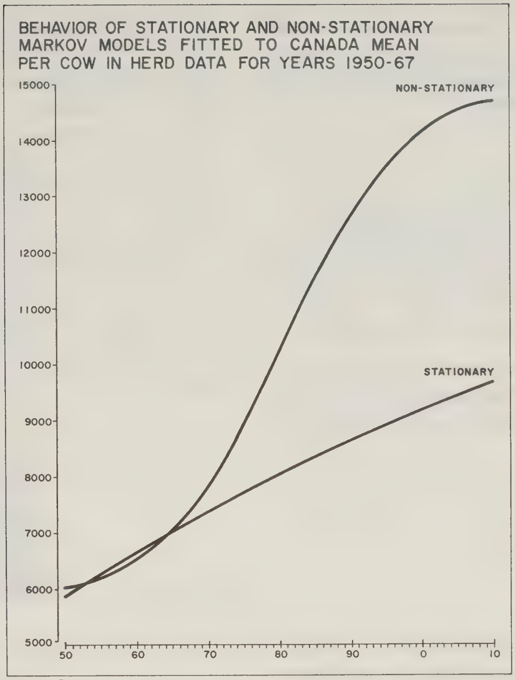

Figure 2

However, the model will be used to look into the future as well as to explain past behavior. This process is called extrapolation. Since there are no data for the future, the criterion must be developed in another way. A simple and effective approach is to pretend there are data only up to a certain year "t_z" to fit our model, then compare the extrapolates with the data for years "t_{z+1}, t_{z+2}", etc. This is exactly what is done, and for the purpose of fitting the models and calculating "R^2", the last five years' available data are forgotten. To measure the success in predicting these last five figures the deviations are looked at again and the three following quantities are found:

1) largest $(y_t - y(t))$ in magnitude (6.7)

2) average of $y_t - y(t)$, i.e.
[Sum over last 5t's of $(y_t - y(t))$]/5 (6.8)

This average may be quite small even for large deviations if the "y_t" fluctuate about the model values.

3) The root mean square (RMS) deviation

$$\frac{\sqrt{\text{Sum over last 5t's of } (y_t - y(t))^2}}{5} \qquad (6.9)$$

This will give a measure of the size of the deviations regardless of sign.

In performing trials on all the 49 data series it is found that for Prince Edward Island DHIA data there were, after removing the last five data points, only four observations with which to fit the models. This was the only such case; all other series fitted on at least seven points (the majority on 18). The "R^2" and the three quantities above were then averaged for each of the models using the 48 remaining sets. The results are given in Table 1.

One more measure of the acceptability of the models that is based primarily on the deviations can be obtained. Recall that the deviations were in fact requested as a starting point for analyzing the effects of prices, quotas, etc. Since these are presumed to be short-term effects, the deviations should be somewhat balanced about the model trend line. Relatively long-term cycles about the trend may indicate the model has the wrong shape. The authors do not wish to propose any formal measure of this property, but shall merely state that the quadratic function and the non-stationary Markov process appeared to best satisfy their requirements. Figure 2 shows the differences in shape between the stationary and non-stationary Markov processes by way of illustration.

Under these criteria, which are concerned with how well a model describes the data, the quadratic function is

most favored. However, it is also desired that the model explain and have properties that are in accord with the authors' preconceptions of the real world system they are modelling. Thus, before jumping to accept the quadratic function, it must be recalled that it does not have acceptable long-term behavior, nor has it been derived from a possible mechanism of technological change in the dairy industry. These failings are to some extent corrected in the Markov models. The description of the data provided by the stationary Markov model is poor; it is a dismal sixth out of six in ranking in Table 1, while the non-stationary Markov model has overall second place. It is this model that is therefore recommended to describe and explain technological change in the dairy industry.

This job of modelling is for the moment complete. It has to be recognized that whichever model is chosen, there will still be fairly sizeable errors in the predictions as demonstrated by the average and RMS deviation figures in Table 1. (These deviations are of the order of 5 percent of the level of production per cow). However, an explanation of changing production per cow as a march through time driven by a continuing preference for more productive cows has been the aim. The other factors of production such as feed costs, milk prices and quotas, have been assumed to cause short-term fluctuations about the trend caused by adoption of new technology. If models having greater predictive power are desired, this is too great a simplification. Two difficult subjective questions remain, which every modeller must face: how good a description and/or explanation of reality is needed and how much effort should one be prepared to expend to obtain it.

EFFECT OF TIMOTHY MATURITY AT HARVEST ON FEEDER CATTLE RATION COSTS

*James Lovering**

When non-forage components of beef rations are at high price levels, large savings in per-head ration costs can be achieved by tailoring the quality of timothy to more closely match the dietary requirements of the animals being fed.

The use of a silage harvesting system and more than one variety of timothy permits the harvesting of relatively large acreages of the crop within narrow ranges of quality.

INTRODUCTION

The energy concentration[1] (EC), protein concentration (PC) and dry matter yield (DMY) of the primary growth of timothy varies widely depending on its stage of maturity. Typically, for primary growth, EC and PC decrease while DMY increases with advancing maturity (4). While these relationships are not nearly as clear for secondary growth, the relationships hold for EC, PC and DMY means taken over both primary and secondary growth (Table 1).

Feeder cattle have widely differing requirements for ration EC and PC depending on their age, weight and rate of weight gain. Light weight young animals gaining weight rapidly require high EC and PC in their rations, while older, heavier cattle gaining weight slowly have lower EC and PC requirements. Irrespective of animal age and weight, higher rates of gain require higher EC and PC rations (8).

The management of timothy DMY, by choice of stage of maturity at harvest, or by choice of cutting date, offers substantial opportunity to influence cost per pound of dry matter, since per acre growing costs for timothy vary only slightly as a function of DMY[2]. The EC and PC of the harvested grass, however, can be expected to decline as DMY increases and dollars per pound DM decreases.

TABLE 1. MEAN ENERGY AND CRUDE PROTEIN CONCENTRATIONS AND DRY MATTER YIELDS OF CLIMAX TIMOTHY FOR VARIOUS CUTTING TREATMENTS*

Cutting treatment	Energy** concentration Mcal/kg	Crude protein concentration %	Dry matter yield lb/acre
A	2.33 f***	15.9 a	4,628 h
B	2.32 f	15.3 a	5,050 g
C	2.29 e	14.0 b	5,590 f
D	2.12 d	12.6 c	6,412 e
E	2.14 d	10.9 d	7,181 d
F	2.06 c	9.9 e	7,668 c
G	1.99 b	9.3 e	8,048 b
H	1.90 a	9.2 e	8,722 a

*Data in Kunelius *et al.* (4) have been regrouped for this table

**Metabolizable energy

***Duncan's multiple range test — values within a column followed by the same letter are not significantly different (P = 0.05)

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[1] Only metabolizable energy (Mcal/kg of dry matter) is considered in this paper.

[2] Where DMY is controlled only by cutting treatment.

The cutting date for timothy which leads to the least-cost ration depends on: (1) the EC and PC required in the ration and (2) the unit cost of feed components that must be used to supplement timothy to meet the animal's EC and PC requirements.

This paper examines the feed costs for a range of feeder cattle classes fed rations whose forage component is Climax timothy, cut at various stages of maturity. The cutting treatment(s) for timothy leading to least-cost rations for various classes of cattle is indicated for two forage/grain price ratios.

TIMOTHY – CUTTING DATE, YIELD AND QUALITY

The data presented in this section are part of the results of an experiment conducted at Charlottetown, Prince Edward Island (4). The timothy was grown over a three-year period in a randomized block experimental design with three replications. As Kunelius *et al* state: "Forage yields were determined by cutting a 1.25–meter–wide swath in the middle of each plot at a height of 6 centimeters." (4). Crude protein was estimated as 6.25 times total nitrogen in the grass. In vitro (in the laboratory) digestibility of the grass was also determined. Two cuts were taken each year.

TABLE 2. MEAN CUTTING DATES AND STAGE OF MATURITY OF CLIMAX TIMOTHY FOR VARIOUS CUTTING TREATMENTS*

Cutting treatment	Average date	Cut 1 stage of maturity	Cut 2 average days from cut 1
A	June 9	vegetative	47
B	June 14	vegetative	48
C	June 18	boot	47
D	June 22	early heading	51
E	June 25	heading	52
F	June 29	heading	54
G	July 3	early flowering	56
H	July 6	flowering	57

*Taken from Kunelius *et al.* (4)

Table 2 defines the cutting treatments applied to the grass in terms of average date and stage of maturity at cutting, and the mean number of days between the first and second cuts for the three years.

Table 1 shows mean DMY, mean EC and mean PC over the three years for each treatment. EC and PC for each cut and year were weighted by the relevant DMY in calculating their means for each treatment.

In vitro digestibility or digestibility of dry matter (DDM) was converted to percent total digestible nutrients (TDN) using the following equation derived from *in vivo* (live animals) investigations.

$$\text{TDN } (\%) = 5.81 + 0.869 \text{ DDM } (\%) \qquad (3)$$

Percent TDN times 0.036155 was used to estimate metabolizable energy concentration (mcal/kg) (8).

There are several factors that require consideration in the use of these data for the purposes of this paper. Weather and harvesting losses incurred in the experiment from which the data were taken are certain to be extremely small relative to those incurred on farms. Hence, DMY, EC and PC values reported here are higher than those that could be expected if the same production and cutting treatments were applied in farm situations.

Also, it is known that the suitability of weather for forage harvesting varies over the range of cutting dates shown in Table 2 (June 9 to July 6) (1). In farm situations, therefore, the DMY, EC and PC values shown here for the various cutting dates are likely to be reduced more for cutting treatments earlier and later than for those occurring in the period June 21 to June 25. A wilted silage harvest system has been assumed in estimating dollars per pound DM values because this system reduces the effects of weather on DMY, EC and PC (relative to those incurred in making hay, for example) and can be expected to reduce the differential effects of weather in various parts of the range of cutting dates.

TIMOTHY – COST PER ACRE AND PER POUND OF DRY MATTER

As mentioned, dollars per pound DM estimates used in this paper assume a wilted silage harvest system. The cost estimates include the seed and fertilizer amounts used in the experiment, and assume a 10-year life for the timothy planting. A cost of $88 an acre[3] of timothy with DMY equal to 4,600 pounds an acre (cutting treatment A) is the basis for dollars per pound DM estimates (6). Cost per acre has been adjusted up by $0.16 for each 100 pounds DM harvested in excess of 4,600 pounds an acre to cover the harvesting, transportation and storage costs of higher yields (6). Table 3 shows dollars per pound DM for each cutting treatment as means over both cuts and three years.

[3] Includes production, harvest, transportation and storage.

TABLE 3. COST PER POUND OF DRY MATTER OF CLIMAX TIMOTHY FOR VARIOUS CUTTING TREATMENTS FOR THREE YEARS

Cutting treatment	Cost of dry matter, three year means, $/lb
A	0.0190
B	0.0175
C	0.0160
D	0.0140
E	0.0128
F	0.0121
G	0.0116
H	0.0109

FEEDER CATTLE — DESCRIPTION OF CLASSES

The classes of cattle and management programs chosen represent various weights and ages at the beginning of the feeding period and various rates of gain. The variations in these factors are reflected in the EC and PC of the required rations (Table 4).

The EC and PC values for each class of cattle were estimated on a length-of-keep basis from NRC's Nutrient Requirements of Beef Cattle (8). These EC values were used to calculate the proportions of timothy and barley required in the rations for each class of cattle. The proportions varied within each cattle class as a function of the quality of the timothy, i.e., as a function of the applied cutting treatment. The required amounts of timothy and barley, fed in these proportions to the various cattle classes, were estimated using an equation developed by Zulberti and Reid (10). This equation estimates the total metabolizable energy requirement for growing and fattening cattle as a function of muscular work, age, rate of weight gain, animal weight and ration EC.

It is difficult to assess the accuracy with which *in vitro* digestibility estimates the metabolizable energy concentration of the grass. In any event, EC estimates for the various cutting treatments were made on the same basis; so that if a bias exists, it may be expected to be a consistent one. This is particularly true since the equation used to estimate total metabolizable energy requirements has EC as an explicit variable.

ESTIMATES OF RATION COSTS

The costs of rations balanced for energy and protein were estimated for all combinations of class of cattle and cutting treatment. Table 5 shows these costs for timothy yields averaged over the two cuts and the three years of the experiment for two levels of non-forage cost. Barley, soybean oilmeal and urea are priced at $0.05, $0.10 and $0.08 per pound, respectively, in the first; and at $0.025, $0.06 and $0.04 per pound, respectively, in the second.

Varying with the class of cattle, the within-cattle-class differences in ration costs range from about $9 per head to about $38 per head for the higher priced barley and protein supplements. Cutting treatment H invariably leads to the highest-cost ration, irrespective of class of cattle, for the higher priced non-forage components.

The within-cattle-class differences in ration costs range from about $3 per head to about $14 per head for the lower priced barley and protein supplements. Cutting treatment A leads to the highest-cost rations for all but one cattle class when the non-forage components are at the lower price.

TABLE 4. DESCRIPTION OF FEEDER CATTLE CLASSES AND THEIR REQUIREMENTS FOR DIETARY ENERGY AND PROTEIN CONCENTRATIONS

Class	Description	Energy*,** concentration Mcal/kg	Crude protein** concentration %
I	400 lb calf wintered 220 days, 0.5 lb ADG***	2.10	10.6
II	400 lb calf wintered 220 days, 1.25 lb ADG	2.20	11.7
III	400 lb calf fed 300 days, 2.3 lb ADG	2.67	12.0
IV	700 lb feeder wintered 220 days, 0.5 lb ADG	2.06	8.5
V	700 lb feeder wintered 220 days, 1.0 lb ADG	2.06	8.9
VI	700 lb feeder fed 160 days, 2.3 lb ADG	2.60	11.1
VII	550 lb feeder fed 160 days, 2.3 lb ADG	2.67	11.8
VIII	920 lb feeder fed 80 days, 2.3 lb ADG	2.60	11.1

*Metabolizable energy

**Estimated from NRC's Nutrient Requirements of Beef Cattle (8)

***Average daily gain

TABLE 5. RATION COMPONENTS AND COSTS FOR COMBINATIONS OF CATTLE CLASSES AND CUTTING TREATMENTS FOR TWO PRICES OF BARLEY AND PROTEIN SUPPLEMENTS

		Dry matter		Total ration cost* $ per head for length of keep	
Cattle class	Cutting treatment	Timothy lb	Barley lb	Barley at $0.025/lb	Barley at $0.05/lb
I	A	2,145	–	41**	41***
	B	2,158	–	38	38
	C	2,196	–	35	35
	D	2,434	–	34	34
	E	2,404	–	31	31
	F	2,354	111	34	38
	G	2,181	283	37	46
	H	1,997	468	37	54
II	A	2,910	–	55	55
	B	2,929	–	51	51
	C	2,987	–	48	48
	D	2,868	305	48	55
	E	2,937	235	47	56
	F	2,674	498	53	71
	G	2,477	695	56	80
	H	2,264	907	57	86
III	A	2,302	2,791	114	183
	B	2,261	2,831	110	181
	C	2,159	2,933	108	181
	D	1,716	3,376	109	194
	E	1,762	3,331	107	191
	F	1,604	3,489	108	196
	G	1,487	3,606	109	200
	H	1,360	3,734	109	204
IV	A	2,620	–	50	50
	B	2,635	–	46	46
	C	2,681	–	43	43
	D	2,973	–	42	42
	E	2,936	–	38	38
	F	3,089	–	37	37
	G	2,864	226	39	45
	H	2,620	470	40	52
V	A	3,129	–	59	59
	B	3,149	–	55	55
	C	3,209	–	51	51
	D	3,590	–	50	50
	E	3,541	–	45	45
	F	3,744	–	45	45
	G	3,471	273	47	54
	H	3,176	569	49	63
VI	A	1,624	1,251	62	93
	B	1,599	1,277	60	92
	C	1,523	1,351	58	92
	D	1,213	1,662	59	100
	E	1,242	1,633	57	98
	F	1,130	1,745	58	101
	G	1,049	1,826	58	104
	H	957	1,917	59	107
VII	A	1,704	2,066	84	136
	B	1,674	2,096	82	134
	C	1,598	2,171	80	134
	D	1,270	2,499	80	143

TABLE 5. RATION COMPONENTS AND COSTS FOR COMBINATIONS OF CATTLE CLASSES AND CUTTING TREATMENTS FOR TWO PRICES OF BARLEY AND PROTEIN SUPPLEMENTS (Cont'd)

Cattle class	Cutting treatment	Dry matter: Timothy lb	Dry matter: Barley lb	Total ration cost* $ per head for length of keep: Barley at $0.025/lb	Total ration cost* $ per head for length of keep: Barley at $0.05/lb
	E	1,305	2,466	79	141
	F	1,188	2,583	80	145
	G	1,101	2,670	80	148
	H	1,007	2,764	81	151
VIII	A	891	686	34	51
	B	877	700	33	50
	C	836	741	32	50
	D	666	912	32	55
	E	681	896	31	54
	F	620	957	32	56
	G	576	1,002	32	57
	H	525	1,051	32	59

*Total ration cost includes, in addition to timothy and/or barley, urea and/or soybean oil meal where required for the situations described in Table 4.

**Urea at $0.04/lb, soybean at $0.06/lb

***Urea at $0.08/lb, soybean at $0.10/lb

LEAST-COST CUTTING TREATMENTS

Least-cost timothy cutting treatment(s) for each class of cattle and for both sets of prices for the non-forage ration components are shown in Table 6. For the purposes of this paper, "near-optimal" rations have been defined as those falling within the range "actual least-cost" plus 5 percent. This definition incorporates an estimate of the ability of the data and procedures used here to recognize real differences among cutting treatments.

TABLE 6. LEAST-COST CUTTING TREATMENTS OF CLIMAX TIMOTHY FOR VARIOUS CLASSES OF FEEDER CATTLE FOR TWO PRICES OF BARLEY AND PROTEIN SUPPLEMENTS

Cattle class	Least-cost cutting treatments: barley at $0.025/lb*	Least-cost cutting treatments: barley at $0.05/lb**
I	E	E
II	C, D, E	C
III	B, C, D, E, F, G, H	A, B, C
IV	E, F	E, F
V	E, F, G	E, F
VI	C, D, E, F, G, H	A, B, C
VII	B, C, D, E, F, G, H,	A, B, C
VIII	C, D, E, F, G, H	A, B, C

*Urea and soybean oilmeal at $0.04 and $0.06/lb, respectively

**Urea and soybean oilmeal at $0.08 and $0.10/lb, respectively

At the lower prices for the non-forage components of the rations, and considering cattle with relatively high dietary EC requirements, there are several cutting treatments that lead to a near-optimal ration; the choice of cutting treatment is, however, more critical for cattle with relatively low dietary EC requirements.

The choice of cutting treatment is important to near-optimal ration formulation for all classes of cattle when the non-forage components of the rations are at their higher prices; the near-optimal cutting treatments are closely related to the dietary EC and PC requirements of the various classes of cattle. The implication is that farmers would benefit from carefully tailoring their management of the timothy crop to the EC and PC requirements of the class of animal being fed.

APPLICATION TO FORAGE MANAGEMENT

Table 2 indicates that the number of calendar days between the various cutting treatments ranges from three to five days. This means that, for any acreage requiring more than three or four calendar days for harvesting, it will not be possible to apply a single near-optimal cutting treatment. Only animal classes I and II, however, have a single cutting treatment determined as near-optimal; the remainder have two or three near-optimal cutting treatments as shown in Table 6, for the higher price levels of the non-forage ration components.

TABLE 7. EXPECTED ACREAGES* OF CLIMAX TIMOTHY THAT CAN BE HARVESTED AT THE NEAR-OPTIMAL STAGES OF MATURITY FOR VARIOUS CLASSES OF CATTLE

	Barley at $0.025/lb		Barley at $0.05/lb	
Animal class	Near-optimal maturity stage(s)	Maximum expected acreage*	Near-optimal maturity stage(s)	Maximum expected acreage*
I	E	26	E	26
II	C, D, E	77	C	26
III	B, C, D, E, F, G, H	183	A, B, D	81
IV	E, F	54	E, F	54
V	E, F, G	76	E, F	54
VI	C, D, E, F, G, H	156	A, B, C	81
VII	B, C, D, E, F, G, H	183	A, B, C	81
VIII	C, D, E, F, G, H	156	A, B, C	81

*This assumes a work rate of 1.75 acres/hour, 6 hours per day, ability to harvest 6 x 1.75 acres of grass on every day without rain, and dry-day probabilities of 0.53, 0.57, 0.62, 0.70, 0.70, 0.68, 0.60 and 0.67 for the dates shown in Table 2 for cutting treatments A, B, C, D, E, F, G and H, respectively (1).

Table 7 shows the expected acreages of timothy that may be harvested at the stage of maturity, or level of quality, necessary to permit the formulation of the near-optimal ration(s) for each class of feeder cattle, for both sets of prices of the non-forage ration components. The expected acreage calculations are based on the conditions specified in the footnote to Table 7. Near-optimal rations formulated with high-priced non-forage components are much more demanding in respect of timothy quality than are those formulated with low-priced non-forage components.

The former's requirement for narrow ranges in timothy quality implies substantial difficulty in the harvesting of relatively large acreages of timothy of a specific quality, as is shown in Table 7.

There are several means by which larger acreages of timothy can be harvested to yield EC values that lie within narrow ranges. Some of these are: (1) larger capacity harvesting equipment; (2) use of more than one harvesting outfit; (3) use of timothy varieties that reach a particular stage of maturity at various calendar dates, giving a longer time in which to harvest the grasses at a particular quality; and (4) harvesting and storing the grass as direct-cut silage (as opposed to wilted silage), permitting longer work days and more work days in a given calendar period.

Alternatives 1 and 2 involve additional machine, labor and management inputs. Alternative 4 gives lower quality silage with unpleasant odors, reduced feed intake and reduced animal performance (9). Alternative 3 appears to offer a solution to the problem of timely harvesting for relatively large acreages of grass with no increase in investment and little crop quality decrease relative to that which can be harvested from smaller acreages.

The number of days between the arrival of the Clair, Climax, Drummond and Bounty timothy varieties at the EC levels associated with each of the cutting treatments were inferred from a note by Langille and Calder (5) which reports the results of an experiment at Nappan, Nova Scotia. Although the calendar dates at which the timothy varieties reached particular EC values are much later than those reported by Kunelius *et al,* it is assumed that differences between dates at which the various varieties reached the same EC value are applicable to the present problem. Since the annual DMY's of the varieties are essentially the same (2), the dollars per pound DM for the various cutting treatments shown for Climax (Table 3) should apply equally well to Clair, Bounty and Drummond. This means that the conclusions drawn about near-optimal cutting treatments for Climax should apply equally well to the other varieties, assuming their growth functions have similar shapes.

Table 8 shows the differences in dates at which the four varieties reached the EC values associated with each cutting treatment and the number of calendar days required to harvest 25 acres of grass, taking into account the dry-day probabilities associated with the dates of each cutting management.

The maximum expected acreages of the four varieties combined that can be harvested at the qualities defined for each cutting treatment (Table 1) are given in Table 9. Since there are several near-optimal cutting managements for most animal classes, it can be expected that larger acreages may be harvested when the timothy is at desired levels of quality.

TABLE 8. DAYS BETWEEN THE ARRIVAL OF THE CLAIR CLIMAX BOUNTY AND DRUMMOND TIMOTHY VARIETIES AT PARTICULAR LEVELS OF ENERGY CONCENTRATION, FIRST CUT ONLY

Cutting treatment	EC* Mcal/kg	Differences (days) between the arrival of varieties at specified EC levels**				Calendar days to harvest 25 acres***
		Clair	Climax	Drummond	Bounty	
A	2.33	−10	0	2	6	4.5
B	2.32	− 9	0	3	6	4.2
C	2.29	− 8	0	4	5	3.8
D	2.12	− 7	0	6	3	3.4
E	2.14	− 6	0	6	4	3.4
F	2.06	− 7	0	8	1	3.5
G	1.99	− 9	0	10	− 2	4.0
H	1.90	−11	0	17	−12	3.6

*Metabolizable energy concentration.

**Differences shown for Clair are relative to Climax.
Differences shown for Bounty are relative to Drummond.
Differences shown for Drummond are relative to Climax.
These data were inferred from Langille and Calder (5).

***Calculated on the assumptions and data listed in the footnote to Table 7.

Animal classes III and VII, for example, can be provided with timothy of near-optimal quality (low-priced non-forage ration components) when the grass is cut over a period of about 40 days and when four varieties are used. This implies the ability to harvest a maximum of about 250 acres (10.5 acres/day and an average dry-day probability of 0.6).

Under conditions of high-priced non-forage ration components the maximum expected acreage that could be harvested at near-optimal quality levels for animal classes III and VII would be about 200.

TABLE 9. MAXIMUM EXPECTED ACREAGES OF CLAIR, CLIMAX, DRUMMOND AND BOUNTY VARIETIES OF TIMOTHY THAT CAN BE HARVESTED AT VARIOUS QUALITIES*

Cutting treatment	Maximum expected harvested acreage**
A	102
B	110
C	108
D	97
E	94
F	86
G	92
H	112

*Qualities defined in Table 1 for each cutting treatment.

**Maximum expected acreage of the four varieties combined that can be harvested at the qualities defined for each cutting treatment. The calculation of these expected acreages are based on the data and assumptions given in the footnote to Table 7.

The foregoing discussion of methods of harvesting relatively large acreages of timothy at a particular EC level applies to the first cut only. Second cut EC values varied little with the cutting treatment applied to the first cut, and PC in the second cut declined more slowly than did PC in the first cut. These factors, along with the fact that second cut yields are less than first cut yields, imply that timing of the second cut is much less critical than it is for the first.

Work in progress at the Fredericton Station gives strong preliminary evidence that the use of four timothy varieties can effectively lengthen the period of time in which timothy of a given quality may be harvested. This work involves the Clair, Champ, Climax and Bounty varieties grown in 3-acre plots, harvested when 80 percent of the timothy heads are out of the boot, and fed to lactating dairy cows. The performance of the cows fed on the wilted timothy silage is being compared to that of cows fed corn silage. The four timothy varieties have been found to reach the early head stage five to seven days apart (2).

CONCLUSIONS

When non-forage components of beef rations are at high price levels, large savings in per-head ration costs can be achieved by tailoring the quality of timothy to more closely match the dietary requirements of the animals being fed. The use of a silage harvesting system and more than one variety of timothy permits the harvesting of relatively large acreages of the crop within narrow ranges of quality.

The importance of choosing a cutting date that yields a product closely matching an animal's dietary requirements is much reduced when the prices of non-forage ration components are relatively low.

ACKNOWLEDGEMENTS

The assistance of Mr. M.J. Green in computing and advice from Dr. H.T. Kunelius are acknowledged with thanks.

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POLICY AND PROGRAM DEVELOPMENTS

CANADIAN WHEAT BOARD ACT

(Amendment concerning final payments)

This change in the Wheat Board Act, set out in Bill S-6, received royal assent in the House of Commons on March 13, and was expected to be proclaimed (i.e. to become law) by the end of May. In the expectation of that conclusion, the following explains the meaning of the amendment: It provides that final payments on deliveries in any pool period shall not be made until, on, or after January 1 of the calendar year commencing after the end of the pool period. (This will prevent the recurrence of more than one set of final payments being made in a single taxation year, as happened in 1972.)

MANITOBA VEGETABLE ORDER

(Under the Agricultural Products Marketing Act)

This Order gives authority to the Manitoba Vegetable Producers' Marketing Board to regulate the marketing of potatoes in interprovincial and export trade. Under the Order, "vegetables" are to be interpreted as potatoes grown or harvested in the province. Potatoes sold for manufacturing under a contract made before planting are not included in the Order. Specific details of the operation of the plan would normally be set out in further legislation. (Gazette, March 12)

ONTARIO EGG MARKETING LEVIES ORDER (APRIL 14, 1975)

(Under the Agricultural Products Marketing Act)

The Order provides for collecting levies of five cents a dozen within the producer's allotment and of 35 cents a dozen in excess of allotment, by the Ontario Egg Producers' Marketing Board. The Order is effective until August 31, 1975. (Gazette, April 23)

ONTARIO MILK MARKETING LEVIES ORDER (April 1, 1975)

(Under the Agricultural Products Marketing Act)

The Order authorizes the collection of levies of 45 cents for each 100 pounds of milk or 12.86 cents a pound of butterfat, not in excess of quota, sold to the Ontario Milk Marketing Board. On sales in excess of quota the levy is $4 for each 100 pounds of milk or $1.14 a pound of butterfat. (Gazette, April 23)

PRAIRIE GRAIN ADVANCE PAYMENTS ACT

Amendment to increase advance payments and to treat spouses as one person. In effect March 24, 1975.)

This amendment increased total advance payments for threshed grain delivered under the permit book from $6,000 to $15,000. It also increased advances to multi-farm units (partnerships, co-operatives, corporations) to a maximum of $30,000 for two shareholders (formerly $6,000) and $45,000 for three or more shareholders (formerly $6,000). Under the amendment, spouses are now treated as one person. A shareholder, partner or member, and his/her spouse, are eligible for the single-person maximum.

At the time of writing, a second amendment to the Act, Bill C-53, was awaiting second reading in Parliament. This bill, when passed, would increase maximum payments on unthreshed grain and for drying of grain.

(A Summary)

CANADA GRAIN ACT

(Amendments to Canada Grain Regulations were effective April 1, 1975.)

1. The amendment March 18 introduced three changes in regulations affecting elevation of grain: combined tariffs for receiving and shipping, uniform elevator charges in the Eastern Division, and graduated charges for drying grain.

   (1) Maximum elevator tariffs on grain for domestic use and for export now combine the charges for receiving, weighing and shipping. This allows operators to establish their own separate rates for these services within the maximum tariff. New maximum rates on grain for export are the following: into vessels, $51 per 1,000 bushel; into railway cars, $53.50 per 1,000. On grain for domestic use rates are: into vessels, $55 per 1,000; into railway cars or conveyors, $60 per 1,000 and into trucks, $65 per 1,000.

   (2) In place of separate rates for elevators at Bay and Transfer ports, and those at St. Lawrence and Atlantic ports, there is now a uniform maximum charge throughout the Eastern Division (everything east of Thunder Bay).

(3) Where the maximum charge for drying grain was previously $50 per 1,000 bushel, regardless of moisture levels, the new rates are adjusted to four moisture levels: Tough $50, Damp $75, Moist $100, and Wet $250 (each per 1,000 bushel). (Gazette, April 9)

2. The second amendment (also March 18) permits railway companies to transport grain through inspection points such as Winnipeg and Thunder Bay without official inspection. This is intended to speed up movement of feed grains from primary elevators in the Western Division to the Eastern Division. It eliminates delays caused by holding sample carloads in rail yards for inspection by the Grain Commission. (Gazette, April 9)

NOVA SCOTIA EGG ORDER

(Under the Agricultural Products Marketing Act)

The Order authorizes the Nova Scotia Egg and Pullet Producers' Marketing Board to collect levies from egg producers in the province. This order is similar to many others in which authority is requested to extend power under the Agricultural Products Marketing Act to provincial commodity boards for control of produce originating within the province. This authority enables the above-named Board to operate the provincial plan. (Gazette, March 26)

ONTARIO WHEAT MARKETING AGREEMENT — Interim Payments

(Under the Agricultural Products Co-operative Marketing Act)

The Ontario Wheat Producers' Marketing Board has been authorized to make an interim payment to primary producers of $1.00 per bushel for No. 2 C.E. wheat at 14 percent moisture purchased by the Board in the 1974-75 crop year. This payment is in addition to the $2.01 per bushel initial payment made when the wheat was first delivered to the Board. Both payments are in accordance with an agreement (signed June 20, 1974) between the Government of Canada and the Ontario Wheat Producers' Marketing Board under the Agricultural Products Co-operative Marketing Act for the marketing of wheat in Ontario.

In both cases the payment distributed is the producers' money resulting from the successful sale of the 17.1 million bushels of wheat purchased by the Board in 1974-75. The Board will distribute any funds remaining in the pool account after all sales are completed later this year.

NEW BRUNSWICK MILK MARKETING ORDER

(Under the Agricultural Products Marketing Act)

It gives the New Brunswick Dairy Products Commission power to regulate the marketing of milk in interprovincial and export trade, and to collect levies from producers.

ONTARIO BEAN PRODUCERS' MARKETING BOARD — Interim Payment

(Under the Agricultural Products Co-operative Marketing Act)

It authorizes the Ontario Bean Producers' Marketing Board to make an interim payment to primary producers of $2 a hundredweight for pea beans, and of $15 a hundredweight for yellow-eye beans. This is under the agreement of June 20, 1974, between Canada and Ontario, covering the marketing of pea beans and yellow-eye beans produced in Ontario in 1974.

Background: For several years Ontario producers of pea and yellow-eye beans have been operating a pooling system with credit guarantees provided by the federal government under the Agricultural Products Co-operative Marketing Act. Initial payments are made by the Ontario Bean Producers' Marketing Board upon delivery of the crop, and interim and final payments are made as sales progress, from money resulting from bean sales.

PUBLICATIONS

Readers: in ordering publications please use the addresses as shown.

ECONOMICS BRANCH PUBLICATIONS

Statistical Summary of Marketing Boards in Canada, 1973-74. J.M. Sullivan. Pub. No. 75/2. Free.

Publications 1974. List of material published in 1974. A. Trempe. Pub. No. 75/3. Free.

AGRICULTURE CANADA PUBLICATIONS

Available from the Information Division, Agriculture Canada, Ottawa, K1A 0C7

Annual Flowers for Canadian Gardens. Ottawa, 1973, reprinted 1974. 32 p. Illus. 25cm. Paper cover. (Publication 796.) Cat. No. A53-796. Free.

Common and Powdered Scab of Potato. Research Station, Fredericton, N.B. Ottawa, 1974, reprinted 1975. 7p. Figs. 23cm. Paper cover. (Publication 1530). This publication replaces Publication 953, Common Scab of Potato. Cat. No. A53-1530. Free.

Apples. Published by Departmental Publications – Agriculture, Ottawa, 1970, reprinted 1975. 23p. Illus. Tables, 23cm. (Publication 1402). Prepared by the Food Advisory Services. Cat. No. A73-1402. Free.

Canadian Grain Exports, Crop Year 1973/74. Published by Departmental Publications. (Ottawa) 1974, 48p. Tables, charts, 27cm. Paper cover. Cat. No. A91-3/1974. Free.

Soil and Air Temperature at Ottawa. C.E. Ouellet. Ottawa, 1975. 29p. Tables, Figs, 23cm. Paper cover. (Publication 1541). Cat. No. A53-1541. Free.

The Lighter. Quarterly. 23cm. Paper cover. Partly bilingual. Vol. 45, No. 1, Winter, 1975, 42p. Cat. No. A27-10/45-1

Control of Fabric Pests. C.G. MacNay, revised by N.J. Bostanian. Ottawa, 1974. 16p. Illus. 23cm. Paper cover. (Publication 1202) Cat. No. A43-1202. Free.

Culture of Ornamental Trees for Canadian Gardens. R.W. Oliver. Ottawa, 1957, reprinted, 1975. 30p. Figs. 23cm. Paper cover. (Publication 994) Cat. No. A53-994. Free.

Growing and Using Fababeans. L.E. Evans and J.R. Rogalsky. Ottawa, 1975, 21p. Tables, Figs. 23cm. Paper cover. (Publication 1540) Cat. No. A53-1540. Free.

Farming in Canada. Revised 1975. (Publication 1296). 64 p.

Metric and the Grain Trade. Farm Letter No. 96 – 3:75. Bilingual.

STATISTICS CANADA PUBLICATIONS

Fruit and Vegetable Preservation. Pack of Frozen Fruits and Vegetables as Reported up to the End of 1974, Vol. 3, No. 28, December, 1974. Bilingual. (Service Bulletin.) Cat. No. C.S. 32-023. $1.40 per year. *Sold by Information Canada, Ottawa.

PARLIAMENTARY PUBLICATIONS

Standing Committee on Agriculture. Sixth proceeding on Bill S-10, intituled: An Act to amend the Feeds Act. 1st. session, 30th parliament, 23 Elizabeth 11, 1975. Chairman: The Honourable Hazen Argue. No. 9 Thursday, February 20, 1975. 14p. Witnesses: Department of Agriculture: Mr. C.K. Jefferson, Director, Plant Products Division. Department of Justice: Mr. W.G. Johnson, Legislation Section. Cat. No. Y.C. 25-301/1-9. 20c per copy *Sold by Information Canada, Ottawa.

DEFINITIONS

From now on, each issue of Canadian Farm Economics will include a list of definitions to help the reader in his understanding of articles. Each author is asked to select and define two terms that he considers fundamental to his article. The following terms were selected for this issue:

Article No. 1

Well-being comparisons between two (or more) groups of people will normally involve analysis of their respective levels of real income for a given period of time. The following two conceptual definitions are considered fundamental to such real income comparisons:

1. **REAL INCOME OF BENCHMARK GROUP A**
   = money income (net of business costs and taxes paid)
   plus market value of income-in-kind
   plus net appreciation (discounted for inflation) of market value of assets owned.
2. **REAL INCOME OF ANY OTHER GROUP B**
   = money income (net of business costs and taxes paid)
   plus market value of income-in-kind
   plus net appreciation (discounted for inflation) of market value of assets owned
   minus costs of living (often associated with location and including price differences of items purchased at retail level) in excess of such costs incurred by the benchmark group A.

Article No. 2

VARIABLE any measurable characteristic that can assume varying or different values in successive individual cases.[1] The price of hogs fluctuates from period to period and is an example of a variable.

FUNCTION when the value of one variable is related to or depends on the value of another variable, the first is said to be a function of the second. If the number of hogs marketed changes when the price of hogs changes, then hog marketings would be a function of hog prices.

Article No. 3

MODEL a construction used to visualize and/or explain the behavior or appearance of a larger or more complicated system.

BAND-WAGON EFFECT the tendency to acquire, implement or adopt, almost simultaneously with others, a successful idea, method or technology.

Article No. 4

METABOLIZABLE ENERGY the difference between total energy in the ration and the energy lost in feces, urine and combustible gases.

WILTED SILAGE silage made from a crop that has been cut and allowed to lie in the field until its dry matter content has increased to 30 or 35 percent.

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[1] Mordecai Ezekial and Karl A. Fox. **Methods of Correlation and Regression Analysis.** John Wiley and Sons, New York, 3rd edition, p. 32.

IN REPLY

Readers are still responding to the article in the December issue of CFE on "Farm and Off-farm Incomes of Farm Families in Canada". The following are the most recent responses, with the replies of the authors, B.H. Davey and Z.A. Hassan:

Professor J.A. MacMillan of the Agricultural Economics Department of the University of Manitoba, commenting first on comparisons between average income levels of farm families and those of non-farm families (p. 18 of the article), said the statement that "inclusion of income-in-kind would make the comparison more favorable to the rural farm category" needed qualification, since "the $1,201 rental value of a house is likely low relative to urban imputed house rental value." Dr. MacMillan added, "An important factor omitted is the annual change in net worth of farmers."

The authors' reply is : "The results reported in our article are based on the Survey of Consumer Finance (Statistics Canada, 1972). Unfortunately, this survey does not provide information on income-in-kind and changes in net worth. Thus, such data could not be introduced into the analysis. The study indicated that average income of

farm family units was lower than that of non-farm family units, and income distribution was more unequal for rural farm family units than for non-farm family units." However, in their report on the same subject (Economics Branch publication 74/17, Abstract) the authors had concluded that "the position of farm family units relative to all family units would be improved if wealth and income-in-kind were considered along with money income". Therefore, they answer, "we agree with Professor MacMillan that inclusion of net worth and income-in-kind might change the findings".

Professor MacMillan's objection that the article was not clear on the relative importance of age and education ("cross classifications by age and education separately do not show net effects") brought the reply by the authors: "Data for 1973 from the Consumer Finance Survey is to be made available in a forthcoming publication. It is hoped that more detail on age and education classifications will be provided so as to increase the analytical potential of the data."

Several correspondents took exception to the treatment of provincial statistics in the article, as well as commenting on other points. David Wood, Manager of Public Affairs, Western Co-operative Fertilizers Ltd., Calgary, said the article was "tantalizing and frustrating" – the former because it promised information that would have been useful in the company's marketing studies; the latter because it did not separate statistics for the three prairie provinces. "Do separate figures exist? " Mr. Wood asked.

H.H. Bryce, Head of the Statistics Branch, Alberta Agriculture, was also disappointed that the Alberta statistics were lumped together with the other two provinces. He pointed out that these three provinces generate more than half the Canadian farm income.

R.N. Plank, Assistant General Manager, Farm Credit Corporation in Kelowna, B.C., felt that more study was needed on the subject, since 1971 (as the authors say), was a poor year for farming. The values of income-in-kind and tax benefits (federal and municipal) should be studied.

Kenley MacNeill, a Regional Planner of Amherst, N.S., thought more work could have been done by regions (e.g., the age-income relation), and would like to see more articles dealing with socio-economic issues in agriculture.

In the absence of one of the authors, this reply was provided by Dr. W. Darcovich, Farm Family Services Section, Economics Branch, Agriculture Canada: "It is unfortunate that the income information for the three prairie provinces (1971) was grouped and not shown by individual provinces. The grouping was necessary as the size of the sample was not considered large enough to provide reliable estimates for individual provinces.

The Economics Branch of Agriculture Canada is in the process of obtaining similar 1973 data from Statistics Canada. The income information for each of the prairie provinces is being tabulated separately, and will become available in an ensuing publication.

The 1973 data will also be tabulated by more detailed breakdowns of age categories, education levels and other family characteristics. It is hoped that some of the more detailed classifications of family characteristics will be suitable for publication."

CORRECTION

Volume 9, Number 6, December 1974

Page 4, column 1, line 3 – should read greater in the *United States,* rather than greater in *Canada.*

Page 24, title – should read, Combine Sizes for Least-Cost Cereal Harvesting in the Maritime Provinces.

Page 24, column 1, line 7 – should read as combine size increases, rather than with combine size.

Page 25, footnote * – should read at bottom of page, grain to straw ratio is 1:1.

Page 29, Figure 5 – combine capacity and throughput (tons/hr) – should be in the lower right hand corner.

Page 32, column 1, line 32, should read crop lost, not crop loss.

IN REPLY TO AUTHORS AND EDITORS REGARDING APRIL 75 *CANADIAN FARM ECONOMICS*

I have read the following article(s):

(1) An Approach to Identifying and Locating the Low-Income Farmer.
(2) Factors Affecting the Supply of Hogs at the National and Regional Level.
(3) Building Models: An Example from the Canadian Dairy Industry.
(4) Effect of Timothy Maturity at Harvest on Feeder Cattle Ration Costs.

My comments are on article number

This article was: not useful 1 2 3 4 5 6 7 8 9 10 very useful.

Because (e.g., The most important economic and social factors were studied. The work was well documented and the conclusions were useful to me).

Beefs Bouquets (Suggestions to authors, publications committee and editors)

My comments may ( ) may not ( ) be used in a future issue of this publication if the editor wishes.

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CANADIAN FARM ECONOMICS

Agriculture Canada

HON. EUGENE WHELAN, MINISTER – L. DENIS HUDON, DEPUTY MINISTER

Canadian Farm Economics is published bi-monthly by the Economics Branch, Canada Department of Agriculture, Sir John Carling Building, Ottawa, and is based on material prepared by economists of the Economics Branch.

Purpose: To provide current information on agricultural economics for economists, representatives of extension, education, press, agri-business, trade, foreign offices, bio-physical and social science researchers, administrators, librarians and leading farmers.

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Letters from readers: Letters are encouraged and should be addressed to the author or the Managing Editor. Responses . . . comments, suggestions and points of view are important for effective two-way communications. Letters may be used in the following issue of CFE and will be edited prior to publication where necessary.

THE POTATO AS A WORLD FOOD SOURCE*

Potato yield, in terms of calories and protein per acre, is considerably higher than that of wheat and rice, currently the two leading world food grains. Consequently, the potato has definite potential in alleviating food shortages, especially in the developing countries.

*Thomas A. Bennett***

WORLD PRODUCTION AND TRADE

The U.S.S.R. is by far the world's largest potato producer, growing over 30 percent of the world crop. Europe, including the U.S.S.R., produces over 75 percent of the world crop. Canada's potato output, however, is small, accounting for a mere 0.7 percent of world production in 1972 and 1973. North and Central America, together, produced only about five percent of the total in 1973. The developing countries, collectively, produce only seven percent.

World potato production has gradually trended upward and in 1973 was 10.5 percent above the 1961-65 five-year average (282,866 thousand metric tons). Production has increased in all regions except Europe (excluding the U.S.S.R.). European production in 1973 was 6.4 percent below the five-year average. Production in Africa in 1973 was nearly 62 percent above the average, while in South America and Asia production was more than 20 percent above the five-year average.

World trade in potatoes, although fluctuating widely, has also trended upward. In 1972 total world imports were nearly 14 percent above 1967 levels. Canadian imports constituted only three percent of the total while European imports accounted for nearly 79 percent. European countries accounted for about 78 percent of world exports while Canada contributed only three percent.

PER CAPITA CONSUMPTION

In many developed countries, dietetic fads and high pressure selling of other foods have been responsible for lower per capita potato consumption than perhaps would have been the case had consumption been based on its true food value.

Per capita consumption in Canada and the U.S. declined from a peak in the early 1900s to a low in the 1960s. Since the late 1960s, as processed potatoes became popular, total per capita consumption has gradually increased. The consumption of fresh potatoes continued to decline, however, while processed potato consumption advanced. This general pattern is more discernible in the U.S. than in Canada, where the trend is broken by sharp fluctuations from year to year. In the United States, per capita consumption in 1910 was 198 pounds. By 1952 it was down to 102 pounds. From this low point, consumption began to increase, reaching 121 pounds in 1971. In comparison, per capita consumption in Canada in 1971 was 159 pounds. The per capita consumption of table stock potatoes in the U.S. has trended downward while processed potato consumption has increased at a faster rate than the decline in fresh consumption. In Canada, per capita consumption of table stock has remained at about the same level, although

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*A paper presented at the Potato Work Planning Meeting, Research Station, Fredericton, N.B., April 2-4, 1975.

**Thomas A. Bennett is Chief, Market Structure and Cost Section, Marketing and Trade Division, Economics Branch, Agriculture Canada, Ottawa.

fluctuating widely, while processed potato consumption has trended upward sharply. Canadians, on the average, consume more fresh potatoes and less processed potatoes than do Americans. Inflation will undoubtedly affect potato consumption patterns. The drop in real disposable income in both Canada and the U.S. will likely spur a return to greater use of table stock.

IMPORTANCE OF POTATOES AS A WORLD FOOD

It is difficult to evaluate the potato in terms of its importance as a food in relation to all other foods. It is held in high esteem by some and scorned by others. Depending upon the part of the world, the potato may be considered a rich man's food, or an average man's food, or only a poor man's food. In Bangladesh, for example, it is considered a luxury food rather than a staple food. Some have credited the potato with aphrodisiac or medicinal attributes; others have blamed it for numerous maladies. Even today in the developed countries the potato is considered a fattening food and is excluded from the diets of most weight-conscious persons.

For 400 years, since it was introduced to Europe, the potato has been the object of untruths and myths. Although the potato has been credited with making possible the agricultural and industrial development of north central Europe, its acceptance was not without force, as in Prussia, or trickery, as in France. Many believed the potato to be either poisonous or the cause of many diseases. The potato, however, became the most important food crop in Europe and was the mainstay of Germany in two world wars. Its food value was proved long ago on a large scale in Ireland. When the potato was successfully introduced into France, King Louis XVI considered it "bread for the poor". Today the potato remains the poor man's most important vegetable.

In North America the potato is used almost exclusively as a human food. In Europe, a large proportion of the crop is used in the manufacture of by-products and as livestock feed.

In 1940, it was stated that" . . . the potato now exceeds that of any other plant grown for table food and, except in the Orient, it comprises over 25 percent of all plant food consumed"[1]. At that time the world's potato crop exceeded that of any of the cereals. This is no longer true, as cereal acreage and production have increased dramatically in recent years. For example, average potato production in Western Europe exceeded average feed grain production in the period 1960-64 by 18,509 thousand tons. In 1973, feed grain production exceeded potato production by 21,668 thousand tons as a result of increased grain production and a 30 percent decrease in potato production.

Despite the potato's recent decline in importance relative to cereal grains, its longer-run importance may not even now be realized. Because of its peculiar dietetic value and its much higher yield of food per acre compared to cereals, there should be a greater emphasis placed upon potato production throughout the world.

The growing shortage of food to meet global requirements has focused renewed attention on potatoes. In 1971, the International Potato Centre (Centre International de la Papa or CIP) was established at La Molina, Lima, Peru. Its objective is to catalyze and conduct research for potato improvement. Attempts will be made to develop widely adaptable and highly nutritious varieties that can be introduced and promoted in developing countries of both tropical and temperate climates.

The establishment of the research centre is an indication of renewed interest in potatoes as a world food crop. And yet, very little has actually been done to explore the potato's potential for improving the nutritional level of the world. Perhaps there has been an over-emphasis on cereals at the expense of the development of other highly productive and nutritious food crops, such as potatoes.

The potato has, perhaps largely unknown to many, provided a reliable source of nourishment for a large portion of the world's population. It is rich in carbohydrates needed for energy. It is one of the best vegetable sources of protein and vitamin C and has significant amounts of the amino acids, thiamine, niacin, methionine and lysine, which are important in a balanced diet. Potatoes can be considered more important than wheat flour because they contain a higher proportion of the essential amino acid, lysine.

The potato industry is just beginning to come to life with a realization that the potato is a good food. In the U.S., a major in-depth study to determine the complete nutritional value of potatoes is under way. It is being conducted at facilities operated by the University of Idaho, the University of Maine and the U.S.D.A. The U.S. Potato Board has pledged $70,000 to the study which begins with the fall season.

Research already completed at the Agriculture Canada Research Station in Lethbridge and at Michigan State

[1] "The Potato. Its Importance as a World Crop", Ontario Research Foundation Bulletin. March, 1940.

University has emphasized the value of the potato as a protein source and as one of the few foods capable of nourishing a large segment of the world population. M.S. Kaldy of the Lethbridge Station initiated a study to evaluate the protein yield of six crops in terms of quality and quantity[2]. The crops selected were: soybeans, potatoes, corn, beans, peas and wheat (flour). The relative value of proteins was determined by comparison with the complete protein of the egg. On the basis of the protein quality criteria adopted, Kaldy determined that" ... the potato would satisfy more people per hectare than any of the other crops listed, except soybeans". Other studies (Kon and Klein, 1928; Kofranyi and Jekat, 1965) have found that potato protein alone can maintain nitrogen (or protein) balance in the human body. Because of its nutritive value, its ability to yield plentifully under moderate climate conditions, and its relatively good storability, the potato seems capable of nourishing a large segment of the world population.

POTENTIAL FOR IMPROVING NUTRITION IN DEVELOPING COUNTRIES

As has been stated, potatoes are considered more a luxury food than a staple food in many developing countries. There have been only a few instances in which potatoes have been seriously considered as a crop to alleviate world hunger and malnutrition.

A case in point is India, the world's second most populous country where 80 percent of the population is rural. It is a leading producer and consumer of farm products and a leading importer. About 67 percent of the calories consumed in the country are from cereals in comparison to 27 percent in Canada, the U.S. and other countries. No country is so dependent upon cereals as is India for meeting total caloric requirements. Since the population in India is growing faster than food production, the deficiency has to be made up through imports.

In 1965, a study was made of the potential of potatoes to supplement food grains in India[3]. The study indicated that potatoes have a definite potential to reduce the demand pressure on cereals in that country. In terms of total yield, total calories and total protein, on a per acre basis, potatoes far exceed wheat or rice. Potato yield in terms of calories, based on Indian conditions, was calculated to be 74.5 percent higher than for wheat and 58.0 percent higher than for rice. Potato yield in terms of protein was calculated to be 54.0 percent higher than for wheat and 77.6 percent higher than for rice. One thousand acres of potatoes will yield the same amount of calories as 1,745 acres of wheat or 1,581 acres of rice.

TABLE 1. FOOD OUT TURN PER ACRE (5 YEAR AVERAGE 1958-59/1962-63)[4]

	Average Yield (kilo/ac)	Calories from 1 kilo	Protein from 1 kilo	Total calories (000 calories)	Total Protein (gms/acre)
Wheat	328	3,254	102	1,067	33,456
Rice	387	3,593	75	1,178	29,025
Potatoes	3,032	614	17	1,862	51,544

In terms of producer returns per acre, it was estimated that gross revenue is higher for potatoes than for wheat or rice, as shown by the following:

Potatoes: 909.60 rupees/acre
Rice: 212.85 rupees/acre
Wheat: 147.60 rupees/acre

Inputs costs, however, were appreciably higher for potatoes.

On the basis of comparative advantage, nine of eleven provinces in India had a distinct advantage, in terms of calories per acre, in producing potatoes rather than wheat. Although the study made only a cursory examination, it is clear that there are great possibilities for reducing the demand for cereals by replacing wheat and rice acreage with potatoes.

There is a definite challenge in the thought that "potatoes may hold a key to alleviating much of the world's hunger". But will the challenge be accepted? Perhaps there is a need to reconsider the potato's role as a world food crop and place a greater priority on its development in relation to livestock and grain production.

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[2] "Protein Yield of Various Crops as Related to Protein Value," Research Station, CDA, Lethbridge, Alberta, Canada. June 12, 1972.

[3] "Feasibility of Potatoes as a Crop to Supplement Food Grains in India". Rajendra Nath Chaturnedi, M.S. Thesis, Ohio State University, 1965.

[4] Ibid.

CANADIAN DURUM WHEAT: ITS ROLE IN THE WORLD FOOD SYSTEM

The development of new varieties in recent years has led to increased importance of durum wheat among Canadian grains.

Canada has increased its level of exports and its share of world exports in recent years. However, world increase in consumption is slower than for bread wheats. Unreliable production in some countries suggests a need for flexibility in Canadian production to meet particular world requirements from year to year.

*J.S. Carmichael and P. Kampouris**

INTRODUCTION

Durum wheat grows best in a hot and relatively dry climate. It is an important crop in some Mediterranean countries including Italy, Turkey, and Algeria, as well as in more temperate countries such as Canada, the U.S., and Argentina. Durum can be grown in the same areas as soft wheat, but under these conditions it does not develop the vitreous characteristic essential for its usual end use. In Italy, where durum products constitute much of the human diet, the crop is grown in the more arid south. Soft wheat is grown in the north.

Durum is one of the oldest known sources of food. Chinese records show that thousands of years ago the people in the northern regions near Peking ate noodles. The Chinese still eat noodles today. Marco Polo reputedly introduced macaroni and spaghetti to Italy from the Far East. Durum has been used for centuries in North Africa, and probably was known in ancient African civilizations such as Abyssinia.

Durum is a hard wheat, its name being derived from the French word "dur", meaning "hard". Milling produces a granular substance known as semolina used to make pastas, the main end product of durum. The rate of semolina extraction in Canada averages 58-59 percent for top grade durum. Manufacturers particularly in Mediterranean countries favor semolinas of a pure amber color.

The three basic types of pastas are spaghetti, macaroni and lasagna. Semolina is a staple in the Eastern Mediterranean countries. In Turkey, Hungary, Romania and Algeria, it is the basis of at least two meals a day. In some Middle East countries, it is used as breakfast porridge. In others, it is used also for a dish called couscous, consisting of steamed semolina in a platter surrounded by lamb and vegetables. In North Africa, some durum is used to make bread. The drying process that permitted storing and retailing dry macaroni and other durum products spurred the development of the pasta industry.

Quality is a prime consideration in durum production. Production in Canada must take into account both agronomic and quality considerations, which taken together have presented problems in export marketing. In European countries, a bright yellow pigment content in durum is considered essential. In Italy, the major emphasis is on cooking quality and a firm, non-sticky product is desired. The Italian government passed a law in 1968 requiring all pasta products to be made with 100 percent durum semolina. France has a similar law, passed in 1972.

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The criteria of good cooking quality of pasta products are bite, chewiness, gumminess, stickiness, color and smoothness of surface, flavor and residue remaining in the water after cooking. If the pasta is made from durum flour, very little starch remains in the cooking water, and rinsing of the pasta is unnecessary. Protein content is also important. Tests have been devised in Canada to measure it as well as gluten quality, ash content and pigmentation. Test weight, kernel size, vitreousness and color as well as the yield and quality of semolina are important elements in grading standards. Canadian varieties in the past have not matched the bright yellow color of American varieties or the gluten qualities of the Argentinian Candeal durum. Canadian durums, however, usually have a higher protein content than U.S. durums and better color than Argentine durums. In Canada, protein content is slightly lower than that of red spring wheat.

Objectives in durum breeding have been development of varieties with disease resistance (rust, loose smut, kernel smudge) early maturity, shorter and stronger straw, and high yield.

In Canada, durum was first grown commercially about 1920. Mindum was one of the first varieties of reasonable quality. It was followed by improved varieties such as Stewart, Carleton, and Ramsay. Other varieties were suited agronomically but were of poor quality. More intensive research in recent years has produced four new varieties that have improved Canada's export position. These are Hercules (licensed in 1969), Wascana (1970), Wakooma (1973), and Macoun (1974). All are superior to the old varieties and have the color needed for foreign markets. Wakooma and Macoun have superior quality for pasta and are expected to dominate Canadian durum production when seed becomes widely available.

ACREAGE AND PRODUCTION

World production of durum wheat (excluding the U.S.S.R. and China) was a record 18.1 million metric tons in 1972-73 (Table 1). In 1969-70, 1971-72, and 1974-75, production was almost 18 million tons. The 1973-74 production of 15.4 million metric tons was 17 percent below that of the record year.

The U.S.S.R. is thought to be the world's largest producer of durum wheat but no reliable current production estimates are available. The area seeded to durum in the U.S.S.R. is reported to have increased from 4.5 million hectares (12 million acres) in 1965 to almost five million hectares in 1971. The size and quality of the crop are known to vary from year to year. Indications are that acreages have been declining in recent years.

TABLE 1. WORLD-PRODUCTION OF DURUM WHEAT BY REGION

Region	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75
	Million metric tons												
Europe	2.4	2.6	2.2	2.9	2.5	3.5	3.1	3.7	3.8	4.5	4.0	3.8	4.3
Near East Asia	4.9	5.4	4.6	4.9	3.6	5.1	4.0	5.0	4.5	5.2	5.5	4.3	5.4
North Africa	2.5	2.7	2.3	2.4	1.9	2.0	3.1	2.3	2.8	2.7	3.2	2.6	3.0
North America	3.7	2.9	2.8	2.4	2.5	2.4	3.9	5.2	3.6	4.0	4.0	3.5	3.9
– Canada	(1.8)	(1.5)	(0.9)	(0.5)	(0.8)	(0.6)	(1.2)	(2.3)	(2.2)	(1.5)	(2.0)	(1.4)	(1.7)
– U.S.	(1.9)	(1.4)	(1.9)	(1.9)	(1.7)	(1.8)	(2.7)	(2.9)	(1.4)	(2.5)	(2.0)	(2.1)	(2.2)
South America	0.5	0.6	0.7	0.4	0.5	0.5	0.5	0.8	0.7	0.6	0.7	0.6	0.6
Others	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.6
World (excl. U.S.S.R. and China).	14.5	14.8	13.4	13.6	11.6	14.1	15.2	17.6	16.0	17.7	18.1	15.4	17.8

Source: "Durum Wheat 1968/69 – 1971/72" International Wheat Council Secretariat Paper #10 and World Wheat Statistics. International Wheat Council.

The pattern of production of durum (outside of the U.S.S.R. and China) is unlike that of other wheats. North America accounts for 20-25 percent of world production and South America for three to four percent. Almost all the remainder comes from countries on or near the Mediterranean Sea. The largest producer outside of the U.S.S.R. and China (Table 2) is Turkey, with more than 2.1 million hectares (almost seven million acres) in recent years. Italy is the next largest. Production area (Candeal taganrog) in Argentina has normally been between 300,000 and 400,000 hectares. Yields are usually higher than those of other wheats. In 1974-75, Argentina durum production was 580,000 metric tons, (21 million bushels) compared with 600,000 (22 million bushels) the year before. In France, in 1974, production increased from 450,000 metric tons to 550,000 metric tons and in Italy, from 2,620,000 to 2,930,000 metric tons. In the U.S., 1974 production was disappointing, with only 80 million bushels on a record large acreage. The largest production in the U.S. was 106 million bushels in 1969-70.

The country with the largest seeded area (apart from the U.S.S.R. and China) is Turkey (Table 2), where for several years durum has been grown on more than 2.7 million hectares (6.5-7 million acres). Italy, Morocco and Algeria each have up to 1.6 million hectares (nearly four million acres). In the last 10 years, the U.S. except for 1970-71 and 1972-73, has had acreages substantially higher than Canada. In 1974, the U.S. had almost 1.5 million hectares (3.7 million acres) compared with 1.1 million hectares (3 million acres) in Canada. In 1975, the U.S. may plant a record 1.7 million hectares (4.3 million acres).

YIELDS

Yields of durum (Table 2) generally are not as high as yields of other wheat, on a country average basis. However, lower yields of durum usually reflect the fact that it is grown in drier regions. In the most arid areas, such as North Africa, yields fluctuate and are substantially lower than in Italy or the U.S. Turkey has better yields than most African countries but lower yields than Italy or the Americas. In the U.S., the 1974 yield was only 20 bushels an acre compared with 31.9 bushels in 1973.

CANADIAN PRODUCTION

Durum production in recent years has accounted for about 11 percent of total Canadian wheat production.

TABLE 2. DURUM WHEAT ACREAGE, YIELD AND PRODUCTION, SELECTED COUNTRIES

	1971/72			1972/73			1973/74 (Prov.)		
	Acreage	Yield	Production	Acreage	Yield	Production	Acreage	Yield	Production
Country	000 Hectares	Quintals/ Hectare	000 m.t.	000 Hectares	Quintals/ Hectare	000 m.t.	000 Hectares	Quintals/ Hectare	000 m.t.
Europe									
France	178	28.2	502	162	27.8	450	149	29.8	443
Italy	1,596	20.6	3,284	1,594	19.3	3,079	1,534	17.8	2,728
Greece	200	17.5	350	215	18.1	390	227	19.0	431
Spain	237	11.9	286	232	10.3	239	157	10.1	159
North America									
Canada	919	16.6	1,524	1,279	15.6	2,000	1,032	15.2	1,573
U.S.A.	1,159	21.6	2,499	1,032	19.2	1,984	1,204	19.2	2,310
South America									
Argentina	250	16.4	410	281	21.2	596	312	19.2	600
Near East									
Syria	1,274	5.2	662	1,354	13.3	1,808	N.A.	N.A.	N.A.
Turkey	2,736	13.6	3,720	2,735	13.7	3,750	2,743	11.3	3,100
North Africa									
Algeria	1,240	5.9	730	1,470	7.4	1,084	N.A.	N.A.	N.A.
Morocco	1,375	11.6	1,595	1,503	10.8	1,630	1,535	8.5	1,304
Tunisia	700	5.7	400	862	6.4	550	865	5.7	490
World Total (excl. U.S.S.R. and China)			17,145			18,722			15,695

Source: World Wheat Statistics, International Wheat Council Durum Wheat — I.W.C. Secretariat Paper #10.

TABLE 3. DURUM WHEAT – ACREAGE, YIELDS & PRODUCTION – CANADA

Crop	MANITOBA			SASKATCHEWAN			ALBERTA			CANADA		
	Acreage	Yield	Production	Acreage	Yield	Production	Acreage	Yield	Production	Acreage	Yield	Production
Year	000 acres	bu.	'000 bu.	000 acres	bu.	'000 bu.	000 acres	bu.	'000 bu.	000 acres	bu.	'000 bu.
5 year average 1951/52-1955/56	91.2	14.0	1,439	438.6	19.0	7,780	78.8	25.6	2,050	608.6	19.1	11,269
5 year average 1956/57-1960/61	63.2	19.5	1,220	1,106.2	17.9	19,900	220.6	21.5	5,440	1,390.0	18.6	26,560
5 year average 1961/62-1965/66	98.8	18.8	1,880	1,655.6	17.8	29,900	221.0	18.7	3,900	1,975.4	18.0	35,680
5 year average 1966/67-1970/71	104.0	21.7	2,300	1,827	22.2	41,900	260.0	27.9	7,380	2,191.0	22.8	51,580
1969/70	170.0	23.5	4,000	2,600	26.2	68,000	384.0	28.6	11,000	3,154.0	26.3	83,000
1970/71	115	20.9	2,400	2,500	26.4	66,000	450	27.8	12,500	3,065	26.4	80,900
1971/72	141	27.0	3,800	1,889	24.5	46,300	242	24.4	5,900	2,272	24.6	56,000
1972/73	160	25.0	4,000	2,700	23.0	62,000	300	25.0	7,500	3,150	23.3	73,500
1973/74	100	24.0	2,400	2,000	22.0	44,000	250	21.6	5,400	2,350	22.0	51,800
1974/75	100	20.0	2,000	2,500	20.4	51,000	400	21.2	8,500	3,000	20.5	61,500

Source: Statistics Canada Field Crop Handbook.

U.S. durum accounts for four percent of wheat production in that country. Durum, on a world basis, represents less than five percent of total wheat production (excluding the U.S.S.R. and China).

The record Canadian acreage (Table 3) was 3.423 million acres in 1962-63, but the higher yields of 1969-70 produced the largest crop, 83 million bushels (2.26 million metric tons). Both yield and total production have been lower since that time but acreage has remained at high levels since the introduction of Hercules. Yields in the last two years, particularly in 1974, have been below trend.

In recent years, about 85 percent of Canada's durum production has come from the brown soil zones of central and southern Saskatchewan. On a 10-year average, durum yield in Saskatchewan was 22.5 bushels an acre compared with 22.8 bushels an acre for all wheat. In Crop District 4 in southwest Saskatchewan, durum yields have averaged 2.1 bushels an acre more than yields of hard red spring wheat.

A forecast made June 1, 1975 indicates a probable Canadian record of 3.85 million acres.

CONSUMPTION

Per capita consumption of durum wheat (Table 4) tends to be relatively stable. Greece has a per capita consumption of 124 kilograms (about 275 pounds a year), the highest of those countries for which data are available. Production figures suggest that Turkey uses over 200 pounds per capita. Similar high utilization rates may prevail in some North African countries such as Morocco. In Tunisia, consumption in 1970-71 was about 85 kilograms (187 pounds). Among the E.E.C. countries, Italy is by far the largest consumer with 55 kilograms (121 pounds) per capita. Pasta consumption trends are generally similar to those of durum.

The U.S. and Canada are relatively small users of durum with rates of 4.3 kilograms (9.5 pounds) and 5.7 kilograms (13 pounds) per capita. U.S. consumption has been increasing slightly. Some large wheat importers, such as the United Kingdom and Japan, use very little durum with Britain using slightly over 0.5 kilograms (one pound) and Japan approximately 0.9 kilograms (two pounds) per capita.

TABLE 4. USAGE OF DURUM WHEAT FOR HUMAN CONSUMPTION IN SELECTED COUNTRIES, 1967/68 TO 1970/71

	Total consumption				Per head consumption			
	1967/68	1968/69	1969/70	1970/71	1967/68	1968/69	1969/70	1970/71
	Thousand metric tons				Kilograms			
Austria	26	30	32	31	3.5	4.1	4.3	4.2
EEC:	3,372	3,767	3,752	3,857	18.3	20.2	20.0	20.3
Belgium/Luxembourg	32	65	57	38	3.2	6.5	5.3	5.7
France	484	526	515	518	9.7	10.5	10.2	10.2
Germany, Fed. Rep. of	310	330	331	319	5.2	5.5	5.5	5.1
Italy	2,540	2,846	2,834	2,982	48.3	53.7	53.1	55.3
Netherlands	5	–	15	–	0.4	–	1.2	–
Greece		1,094[d]				124.2[d]		
Norway	2	5	4	3	0.5	1.3	1.0	0.8
Portugal	96	96	95	91	10.2	10.1	10.0	9.5
Spain	287	257	221	195	8.9	7.9	6.7	5.9
Sweden	6	6	6	8	0.8	0.6	0.7	1.0
Switzerland	89	97	89	98	14.7	15.8	14.3	15.6
United Kingdom	36	27	32	40	0.7	0.5	0.6	0.7
Canada	110	121	122	...	5.3	5.8	5.7	...
United States [a c]	772	810	872	877	3.9	4.0	4.3	4.3
Japan [b]	32	28	41	46	0.3	0.3	0.4	0.4
Tunisia	...	...	...	430	...	...	...	85.0

a Home-produced durum only: excludes imported pasta products.
b Calendar years beginning 1967.
c Calendar years beginning 1968.
d Average of four years.
... Not available.
– None or Negligible.

CONSUMPTION OF PASTA PRODUCTS IN SELECTED COUNTRIES 1967/68 TO 1970/71

	Total consumption				Per head consumption			
	1967/68	1968/69	1969/70	1970/71	1967/68	1968/69	1969/70	1970/71
	Metric tons				Kilograms			
Austria [a]	22,174	21,996	21,985	22,234	3.0	3.0	3.0	3.0
EEC [a]	2,091,085	2,094,057	2,123,258	2,146,916	11.3	11.2	11.3	11.3
Belgium/Luxembourg [a]	22,616	21,119	25,018	27,953	2.3	2.1	2.5	2.8
France	300,541	301,731	307,462	309,956	6.0	6.0	6.1	6.1
Germany, Fed. Rep. of [a]	197,000	205,000	211,000	220,000	3.3	3.4	3.5	3.6
Italy [a]	1,540,267	1,534,905	1,545,468	1,555,982	29.3	29.0	28.9	28.9
Netherlands [a]	30,661	31,302	34,310	33,025	2.4	2.4	2.7	2.5
Greece		279,960[c]				31.8[c]		
Norway [a]	1,803	1,844	2,180	2,432	0.5	0.5	0.6	0.6
Portugal [a]	52,276	51,485	56,128	51,867	5.6	5.4	5.9	5.4
Spain	53,600	59,900	61,900	81,300	1.7	1.8	1.9	2.4
Sweden [a]	8,300	8,700	9,100	10,000	1.1	1.1	1.1	1.2
Switzerland	55,700	58,500	57,900	57,000	9.2	9.5	9.3	9.1
United Kingdom	27,000	24,000	26,000	29,000	0.5	0.4	0.5	0.5
Canada	81,300	89,600	90,000	...	3.9	4.3	4.2	
United States [b]	580,385	606,550	654,080	695,640	2.9	3.0	3.2	3.4
Japan [b]	75,976	78,136	92,754	95,788	0.8	0.8	0.9	0.9

[a] Calendar years beginning 1967.
[b] Calendar years beginning 1968.
[c] Average for four years.
... Not available

Source: International Wheat Council, Durum Wheat, Secretariat Paper #10.

The proportion of durum used in pasta production varies from country to country. In most E.E.C. countries and in Portugal, Switzerland and Canada, durum probably constitutes about 100 percent of the pasta base. The proportion has been about 90 percent in the U.S., 80 percent in Norway, 75 percent in the United Kingdom, 50 percent in Sweden and only 30 percent in Japan.

Off-grade durum is sometimes used as animal feed, depending on price relationships with feed wheat or coarse grains.

TABLE 5. SUPPLIES AND STOCKS OF DURUM WHEAT IN CANADA

	Supply				Disappearance			
Crop Year	Stocks at beginning of year	Production	Imports	Total Supply	Domestic Disappearance	Exports	Total Disappearance	End of Year Carryover
	'000 Bushels				'000 Bushels			
1961/62	–	14,500	–	–	–	7,202	–	–
1962/63	–	65,700	–	–	–	19,695	–	44,056
1963/64	44,056	53,388	–	97,444	10,803	24,729	35,532	61,913
1964/65	61,913	33,584	–	95,497	7,459	34,135	41,594	53,903
1965/66	53,903	16,902	–	70,805	10,766	33,841	44,607	26,198
1966/67	26,198	28,403	–	54,601	11,133	26,602	37,735	16,865
1967/68	16,865	20,209	–	37,074	9,553	13,191	22,744	14,330
1968/69	14,330	45,415	–	59,745	14,771	18,629	33,400	26,345
1969/70	26,345	83,004	–	109,349	20,246	18,004	38,250	71,099
1970/71	71,099	80,910	–	152,009	19,327	49,751	69,078	82,857
1971/72	82,857	55,997	–	138,854	14,404	63,714	78,118	60,737
1972/73	60,737	73,486	–	134,223	20,172	60,039	80,211	54,013
1973/74	54,013	51,800	–	105,813	15,065	51,689	66,754	39,059
1974/75	39,059	61,500	–	100,559	15,065	–	–	–

Conversion Factor (IWC) – 1 metric ton 36.74371 bushels
Source: Calculated from data in reports of Statistics Canada and of the International Wheat Council.

TABLE 6. EXPORTS BY PRIMARY DESTINATION OF DURUM WHEAT AND FLOUR[a]
Wheat equivalent: Average 1961/62– 1965/66; Yearly 1966/67 to 1971/72[b]

Destination	Average 1961/62- 1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72 (Prov.)	1972/73
				'000 metric tons				
European Economic Community	1,002	1,205	1,032	1,571	1,270	1,383	1,009	1,165
Other Western European destinations	160	466	172	191	202	197	331	335
Mediterranean countries of Africa and other Near East[c]	49	457	420	315	266	723	858	651
Other regular importers	17	50	76	82	107	170	230	168
of which:								
Japan	5	18	25	28	39	50	75	39
Venezuela	10	23	35	38	46	86	103	94
Central America (excl. Honduras Rep.)	2	9	16	16	22	34	52	35
Regular importers[d]	423	329	103	69	50	330	858	1,516
TOTAL	1,651	2,507	1,803	2,228	1,895	2,803	3,286	3,835

[a]Based on International Wheat Council records. Excluding trade between countries not members of the Council.
[b]August/July crop year till 1967/68 (inclusive) and July/June thereafter.
[c]Morocco, Algeria, Tunisia, Libya, Lebanon and Syrian Arab Republic.
[d]All other destinations (mainly People's Republic of China, Eastern Europe, India and the USSR).

In Canada, the domestic disappearance of durum increased fairly sharply about 1970 but appears to have levelled off in the past year or two (Table 5). There was no apparent sharp increase in use of pasta products in Canada in recent years.

WORLD TRADE

World trade in durum has increased markedly over the past 15 years (Table 6). The average world export for the five years from 1961-62 to 1965-66 was 1.65 million metric tons but by 1972-73, it had more than doubled, to over 3.8 million. For 1973-74, however, while data on individual countries are still not available, trade is extimated to have decreased to about three million metric tons. Only a slight increase over that level is anticipated in 1974-75.

The main exporters of durum (Table 7) are Canada, the U.S. and Argentina. The U.S. was the principal exporter in the mid-sixties. Canada in recent years has been the leading exporter, although a smaller producer than the U.S. In 1973-74, Canada exported 46.5 million bushels and the U.S. 42 million. In 1972-73, the U.S. exported 65 million bushels and Canada 60 million. Among the "others", Greece, Tunisia, and Syria have been exporters of small quantities. Turkey, the major producer of durum, has not been an exporter in recent years.

The main importers of durum wheat and flour have been the European Economic Community and the Mediterranean countries, where consumption is relatively high. After Italy passed the bill (in 1968) requiring that all pasta products consumed domestically be made of 100 percent durum, annual shipments of durum into Italy increased (from 370,000 tons in 1964-65/1966-67) to 750,000 tons in 1968-69/1970-71. On the other hand, imports by France fell off to less than a quarter of earlier levels, as production there increased.

TABLE 7. WORLD EXPORTS OF DURUM WHEAT, BY MAIN EXPORTERS

	Average 1964/65 1968/69	Percent of Total	July/June 1970/71	Percent of Total	1971/72	Percent of Total	1972/73	Percent of Total	1973/74	Percent of Total	1974/75
Canada	679	31	1,168	42	1,701	52	1,721	45	1,260	42	
U.S.	862	40	1,014	36	1,194	36	1,663	43	1,191	40	
Argentina	483	22	604	22	368	11	363	10	511	17	
Others	149	7	17		35	1	88	2	38	1	
Total (Excluding EEC intra-trade)	2,173	100	2,083	100	3,298	100	3,835	100	3,000	100	3,044

Source: International Wheat Council, Wheat Statistics.

TABLE 8. EXPORTS OF CANADIAN DURUM WHEAT BY COUNTRY OF FINAL DESTINATION – CROP YEARS 1963-64 TO 73-74

COUNTRY	1963-64	1964-65	1965-66	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1972/73	10 Year Average	1973-74
						– thousands of bushels –						
Western Europe												
European Economic Community[1]												
Belgium and Luxembourg	573	1,248	887	652	449	91	560	668	151	830	611	129
Britain	225	252	397	649	359	384	248	689	635	668	451	1,116
Denmark	–	–	–	22	–	–	–	–	–	–	2	–
France	2,698	3,125	896	490	92	2,286	1,824	810	231	–	1,245	1,193
Germany, Federal Republic of	7,988	7,683	8,096	9,089	3,621	4,573	4,251	7,041	3,722	6,053	6,212	6,890
Ireland	–	13	26	–	11	–	–	59	–	588	70	–
Italy	116	21	616	1,880	1,234	5,862	2,473	7,857	5,810	4,926	3,080	9,597
Netherlands	154	346	510	83	1,108	465	1,030	1,832	3,576	1,850	1,095	44
Totals	11,754	12,688	11,428	12,865	6,874	13,661	10,386	18,956	14,125	14,915	12,766	18,929
Other Western Europe												
Austria	335	578	613	606	638	768	403	411	–	85	444	112
Greece	–	–	–	–	–	–	–	–	–	–	–	142
Malta	–	18	–	–	11	–	19	926	8	–	98	–
Norway	–	–	–	–	–	–	–	112	–	–	11	–
Portugal	411	–	–	–	–	–	842	–	–	493	175	1,068
Spain	–	–	–	–	–	–	–	–	–	–	–	–
Sweden	–	34	19	12	–	–	19	–	–	44	13	–
Switzerland	2,590	2,561	4,063	3,001	1,843	2,687	2,378	1,941	1,484	1,831	2,438	2,447
Totals	3,336	3,191	4,695	3,619	2,492	3,455	3,661	3,390	1,492	2,453	3,179	3,769
Eastern Europe												
Albania	–	522	947	1,337	–	–	–	–	–	–	281	–
Czechoslovakia	–	–	1,096	933	1,107	–	–	–	585	–	372	–
Germany, Democratic Republic of	–	385	–	–	–	–	–	–	–	–	39	–
Poland	–	5,314	2,560	2,434	1,257	147	–	1,837	2,839	2,548	1,894	3,934
U.S.S.R. (Russia)	9,634	–	9,937	4,496	426	–	–	1,119	18,307	15,271	5,919	2,433
Totals	9,634	6,222	14,540	9,200	2,791	147	–	2,956	21,731	17,819	8,504	6,367
Africa												
Algeria	–	–	–	–	–	–	1,543	9,602	8,445	8,752	2,834	13,647
Morocco	–	–	–	–	–	–	–	113	220	–	33	–
Mozambique	11	–	–	–	–	–	–	–	–	–	1	–
Republic of South Africa	–	–	–	–	–	–	–	412	720	–	113	–
Tanzania	–	–	–	–	–	–	–	8	–	–	1	–
Tunisia	–	–	–	–	462	692	735	2,111	2,125	1,195	732	–
Totals	11	–	–	–	462	692	2,278	12,246	11,510	9,947	3,715	13,647
Asia												
Bangladesh	–	–	–	–	–	–	–	–	848	2,690	354	–
People's Republic of China	–	11,971	2,834	410	–	–	–	8,286	11,716	9,201	4,442	–
India	–	–	–	–	–	–	–	–	–	99	10	–
Japan	–	46	174	385	356	669	–	85	390	141	225	321
Korea, North	–	–	172	–	–	–	–	–	–	–	17	–
Korea, South	–	–	–	–	–	–	379	–	–	–	38	–
Lebanon	–	–	–	–	–	–	–	–	1,103	2,073	318	2,919
Pakistan	–	–	–	–	–	–	–	–	–	261	26	–
Philippines	–	–	–	–	–	–	–	–	–	20	2	–
Syria	–	–	–	–	–	–	834	3,481	–	–	432	–
Totals	–	12,018	3,179	795	356	669	1,213	11,851	14,057	14,485	5,862	3,240
Western Hemisphere												
Costa Rica	–	–	–	–	–	–	–	–	57	–	6	–
Cuba	–	–	–	88	130	–	448	337	658	390	205	530
Dominican Republic	–	–	–	–	–	–	–	–	77	–	8	–
Guatemala	–	17	–	–	–	–	–	–	–	37	5	–
Venezuala	–	–	–	47	81	2	–	2	10	–	14	–
Totals	–	17	–	135	212	2	448	339	802	428	228	530
GRAND TOTAL EXPORTED	24,735	34,135	33,842	26,615	13,184	18,624	17,986	49,737	63,718	60,048	34,262	46,673
GRAND TOTAL ALL WHEAT EXPORTED	594,516	399,588	584,906	515,303	396,010	305,838	346,498	435,257	503,764	576,596	459,832	419,745

[1] Britain, Denmark, and Ireland are included in the European Economic Community for the complete period even though they joined the Community only in January, 1973.
[2] Includes flour in form of wheat.

Source: Statistics Canada.

Two of the more significant irregular importers recently have been the U.S.S.R. and China. The U.S.S.R. increased its imports from 129 thousand metric tons in 1964-65/1968-69 to 916 thousand in 1972-73. China increased its imports in the same period from 98,000 to 345,000 metric tons.

Imports into African countries vary from year to year, depending on fluctuations in domestic production. Until 1965-66, the African countries and Syria had been net exporters, but in recent years, several African countries have become net importers. There have been small increases in import trading by Venezuela and some countries in Central America.

CANADIAN TRADE

Canada's exports in recent years, particularly since the advent of new varieties, have increased sharply both absolutely and relative to major competitors. The main importers of Canadian durum (Table 8) have usually been West Germany and Italy. Nevertheless, intermittent exports to the U.S.S.R. and China have been very significant. The largest importer of Canadian durum in 1970-71 and 1973-74 was Algeria. The largest Canadian exports were 63.7 million bushels (1.73 million metric tons) in 1971-72 and 60 million (1.63 million metric tons) in 1972-73. Exports in 1973-74 were only 46.5 million bushels (1.27 million metric tons). For 1974-75, exports by late April 1975 were running about five million bushels ahead of the previous year. Over a 10-year period ending in 1973-74, durum exports averaged about 8.5 percent of total Canadian wheat exports.

During the 1960s the value of durum exports by Canada ranged between \$31 million (1962) and \$83 million (1965). In 1973, the export value was \$106 million and in 1974, \$345.6 million due to high durum prices. To these totals can be added \$4.2 million and \$6 million for exports of durum semolina and flour.

PRICES

Prices of durum during the 11 years between 1962-63 and 1972-73 were relatively stable. For four of the eleven years, prices of No. 1 C.W. amber durum, (basis in store, Thunder Bay), averaged slightly below \$2 a bushel; for the remaining seven years, prices averaged above \$2 but not substantially except for the first and last years. Because of the tight world supply-demand situation for grains in the 1973-74 crop year, the price of durum rose sharply to about four times the average for the previous 11-year period.

During the 11 years prior to 1973-74, the price of No. 1 C.W. amber durum was usually slightly higher than the price of No. 1 hard wheat. On some occasions, the prices were similar. In 1971-72, the durum price was slightly below that of No. 1 red wheat. A wide price spread favoring durum developed in 1973. During the early months of 1974-75, asking prices of durum declined somewhat and the price differential between durum and hard wheat narrowed.

WORLD OUTLOOK FOR DURUM

In the short term, durum production can easily be out of balance with demand. This is partly because some of the large producers have relatively inelastic consuming patterns and wide variations in yields. In addition, there has been, and will probably continue to be, irregularity in demand from the U.S.S.R. and China. Beyond the Mediterranean areas there are areas that can grow either bread wheats or durum depending on relative prices. As history shows, large durum supplies can drive durum prices below hard wheat prices.

The wide differential between durum and hard wheat prices in 1973 was due to relatively poor durum production. The high durum prices led to increased production in 1974 but it did not close the gap in prices. The considerable acreage increases in the U.S. and Canada and possibly elsewhere in 1975 could result in a production level that could close the gap. Some countries set prices to induce higher production. In the E.E.C. for 1974-75, a 32-percent increase was made in the guaranteed minimum producer price. In Argentina, the Grain Board in late 1974 announced it would pay \$10 a metric ton more for durum than for bread wheat. In the short term, one can expect plantings of durum in response to price changes to keep durum and hard wheat prices similar.

In the longer run, durum production will respond to demand. Import demand during recent years showed a slight upward trend. It has not increased at as high a rate as for hard wheat. Utilization of durum for human consumption in France, Spain, Portugal and Germany has not kept pace with the increase in population. In the U.S., there is a small upward trend in use of durum. Many of the large developed countries make very little use of durum or its products.

A reasonable production for Canada based on present outlook would be one that would meet an export demand of 60 million bushels (1.63 million metric tons). This would require about 3.5 million acres. Canadian exports might be somewhat higher if Canadian varieties proved to be more acceptable than varieties of competitors. Producers, however, should be prepared to adjust acreage from year to year in response to changes in the outlook for supply and demand.

IRRIGATION IN CANADA: ALBERTA'S ROLE

Alberta accounts for over 50 per cent of the irrigated farmland in Canada. In 1970, about 532,000 acres were irrigated in Alberta, with tame hay the most important irrigated crop followed by barley and improved pasture. Gross cash receipts from irrigated crops accounted for about 20 per cent of total crop receipts.

*G. A. Birchfield and K. D. Russell**

INTRODUCTION

Irrigation has been practised in Alberta for almost 100 years, extensively since about 1900. The earliest recorded use of water for irrigation was in 1879 when a farmer diverted water from Fish Creek, south of Calgary, and irrigated 15 acres. The arrival of the Canadian Pacific Railway at Medicine Hat in the early 1880s signalled a new phase in irrigation development. To generate traffic for the new railway, large-scale irrigation projects were started and settlement was encouraged on land that had been granted to the CPR by the Federal Government. Initial reluctance (due mainly to some very wet years at the time) changed gradually to support for the continuation and expansion of irrigation farming. Expansion has continued and the potential of more extensive irrigation systems is still being investigated (12).

In 1970, almost 3,700 farms reported an irrigation system. Over 760,000 acres of land were classed as irrigable[1] the same year with about 70 percent actually being irrigated[2] (4).

Irrigation farming has been a boon to the local economy and has supported various secondary industries such as sugar factories, feedlots, packing plants, vegetable processing plants, and a broad range of farm supply businesses. The larger population base (the population density in intensively irrigated farming areas was over eight times that of dryland farming areas in Alberta in 1951) (12) supports service industries of many kinds.

This article deals with irrigation in Alberta in three contexts. First, it looks at irrigation in Canada and compares the extent and type of irrigation in the provinces. Second, it examines the role of irrigation farming in Alberta agriculture. Third, it compares the irrigation districts of Alberta in terms of size, crop mix, intensity of irrigation, and gross income. The comparisons are based mainly on census data and other secondary sources.

IRRIGATION IN CANADA (4)

All Canadian provinces reported at least some irrigation in the 1971 Census of Agriculture. However, five provinces made up over 97 percent of the farms reporting irrigation, and almost 99 percent of the total irrigated acreage (Table 1). In terms of acreage, tame hay is the most important crop in four of the five provinces, Ontario being the exception (Table 2). With the exception of hay, crop mixes vary considerably among provinces. The irrigated land in B.C. produces hay, a large acreage of tree fruits and improved pasture, and

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[1] Irrigable land is land for which a farmer has "water rights" or the right to irrigate.

[2] Irrigated land is irrigable land that actually had water applied by various forms of flood or sprinkler systems.

TABLE 1. IRRIGATION DATA FOR CENSUS FARMS, 1970, BY PROVINCE

Area	Farms Reporting	Total Irrigated Acreage	Percent of Total Canadian Acreage	Ave. Irrigated Acreage/ Farm
British Columbia	5,794	220,987	21.2	38.1
Alberta	3,678	537,321	51.6	146.1
Saskatchewan	918	77,489	7.4	84.4
Ontario	3,880	99,472	9.6	25.6
Quebec	2,418	92,895	8.9	38.4
5 Province Total	16,688	1,028,164	98.7	61.6

Source: 1971 Census of Canada — Agriculture. Advance Bulletin on Irrigation Catalogue no. 96-724 (AA-7).

vegetables. Alberta's main irrigated crops are hay, cereals, improved pasture, sugar beets, and potatoes. Tame hay accounts for almost two thirds of Saskatchewan's irrigated acreage; the remainder is split between improved pasture and grain crops. Ontario's irrigated acreage consists mainly of tobacco (64 percent), vegetables, and tame hay. Quebec has a large acreage of oats, and also improved pasture, tobacco, and vegetables.

Alberta has by far the largest irrigated acreage of any province. It alone accounts for over 50 percent of the irrigated land in Canada and leads all other provinces by a wide margin in the production of irrigated grains, flax, tame hay, sugar beets, potatoes, and improved pasture.

IRRIGATION IN ALBERTA

In 1970 Alberta's goods-producing industries had a net value of production (or value added) of over $3.4 billion, almost 10 percent of the Canadian total. Mining contributed the largest proportion to the value added — over 36 percent, but agriculture also had a significant share — $563 million, or about 16 percent (2).

In 1970 the total cash receipts from farming operations in Alberta were $716 million. This included $260 million for crops and $455 million for livestock (11). Cash receipts from irrigated crop production were estimated at about $50 million, about 20 percent of the total crop receipts for the province[3]. Receipts in recent years have been much higher because of higher prices but the relative position of irrigated crop production remains about the same. In census divisions with a relatively high proportion of irrigated farms the proportion of irrigated farms in the $5,000-plus gross income category was slightly higher than for dryland farms (Table 3).

Many farms in the irrigation districts combine dry and irrigated crop and livestock production. The dominant activity varies among districts; in some it is irrigation, with dryland crop and animal production supplementary; in others irrigated crops supplement the main dryland crop and livestock production activities. This is confirmed by results of an irrigation farm survey conducted in 1973[4] (Table 4). According to the survey, more than 35 percent of all irrigated farms have at least 100 acres of dryland crops, and 28 percent of all irrigated farms have a carrying capacity of at least 20

[3]This estimate was based on prices, yields, and acreages from references (11), (8), and (4), respectively.

[4]See Russell, K.D. and B.H. Sonntag, Characteristics of Irrigated Farms in Southern Alberta, *Canadian Farm Economics* Vol. 10, No. 4, to be released in August, 1975.

TABLE 2. CROP ACREAGES UNDER IRRIGATION, 1970, BY PROVINCE

Crop	British Columbia	Alberta	Saskatchewan	Ontario	Quebec	5 Province Total	Canadian Total
Wheat	686	55,003	6,248	182	675	62,794	63,776
Oats	3,887	37,434	2,536	1,871	18,207	63,935	65,140
Barley	1,206	93,615	2,980	399	444	98,644	99,250
Flax	174	22,452	758	8	239	23,631	24,110
Sugar Beets	—	37,375	—	—	1,114	38,489	38,629
Tame Hay	116,923	154,510	48,544	4,041	41,211	365,229	367,168
Potatoes	3,598	22,530	1,921	4,337	5,054	37,440	40,242
Vegetables	9,183	6,228	501	10,760	4,474	31,146	33,480
Tobacco	—	—	—	63,425	6,485	69,910	70,562
Tree Fruits	31,305	177	24	3,351	1,122	35,979	36,105
Improved Pasture	28,473	70,405	9,129	1,530	8,324	117,861	118,228
Miscellaneous	25,552	37,592	4,848	9,568	5,546	83,106	84,470
Total	220,987	537,321	77,489	99,472	92,895	1,028,164	1,041,160

Source: 1971 Census of Canada — Agriculture. Advance Bulletin on Irrigation Catalogue no. 96-724 (AA-7).

TABLE 3. THE PERCENT OF DRYLAND AND IRRIGATED FARMS WITHIN ECONOMIC CLASSIFICATIONS OF THE CENSUS FOR ALBERTA AND SELECTED CENSUS DIVISIONS

Value of Agricultural Products Sold	All Alberta		Census Divisions 1, 2, 3, 5	
	Dryland	Irrigation	Dryland	Irrigation
	— percent of farms in economic class —			
under $5,000	42.2	18.7	22.0	18.5
$5,000 and over	57.8	81.3	78.0	81.5

Source: 1971 Census of Canada — Agriculture. Selected Data for Census Farms Classified by Economic Class — Western Provinces, Cat. no. 96-732 (AA-15), 1973. Ottawa, Statistics Canada.

cows per grazing season on dryland pasture. There is considerable variation among the districts, however, and this variation follows, in general, the differences in intensity of irrigation among districts. For example, only 14 percent of farms in the Eastern Irrigation District (EID) have over 100 acres of dryland crops (excluding dryland pasture and native range), while 95 percent of farms in the Western Irrigation District (WID) have at least 100 acres of dryland crops. Only nine percent of the farms in the Lethbridge Northern Irrigation District (LNID) can support more than 20 cows per grazing season on dryland pasture (excluding community pasture), whereas, 75 percent of the farms in the WID can support 20 cows per season.

In 1971 dryland farms in areas with substantial irrigation activity averaged 1,624 acres in size and had a total capital investment of $146,453 per farm. This was an average capital investment of approximately $90 an acre. Irrigated farms averaged 878 acres and had a total capital investment of $106,051 per farm for an average capital investment of approximately $121 an acre[5]. This indicates that considerably more input resources are required to produce an acre of crop on irrigated land. The higher investment is offset by higher yields and higher revenue specialty crops.

THE IRRIGATION DISTRICTS IN ALBERTA

Physical Characteristics

There are 13 irrigation districts in Alberta, all in the south (Figure 1). The districts are bounded approximately by Calgary in the north, Medicine Hat in the east, and Cardston in the south. The Bow River to the north, the Oldman and South Saskatchewan rivers in the centre and to the east, and the Waterton, Belly, and St. Mary rivers in the southwest supply the water. Most of the irrigated area is within the brown and dark brown soil zones.

The average frost-free period varies from 108 days at Cardston to 127 days at Taber. The mean maximum

[5] Figures based on data included in references (5) and (7).

TABLE 4. PROPORTION OF IRRIGATED FARMS HAVING SIGNIFICANT DRYLAND CROP AND LIVESTOCK ENTERPRISES

Irrigation District[1]	No. of Farms Interviewed	Percent of Farms With $\geq$100 Acres of Dryland Crops[2]	Percent of Farms Managing $\geq$100 A.U.M.[3] on Dryland and Native Range Pasture[4]
United	14	71	29
Raymond	18	67	22
Lethbridge Northern	65	22	9
Taber	41	32	17
St. Mary & Milk River	156	35	22
Bow River	41	46	24
Western	44	95	75
Eastern	96	14	33
Total — All Districts	475	37	28

[1] No data were available for Magrath.
[2] Excluding dryland pasture and native range.
[3] A.U.M. — Animal Unit Month.
[4] Excluding Community Pasture

Source: 1973 Irrigation Farm Survey, conducted by the Economics Branch at the Lethbridge Research Station in cooperation with the Alberta Department of Agriculture.

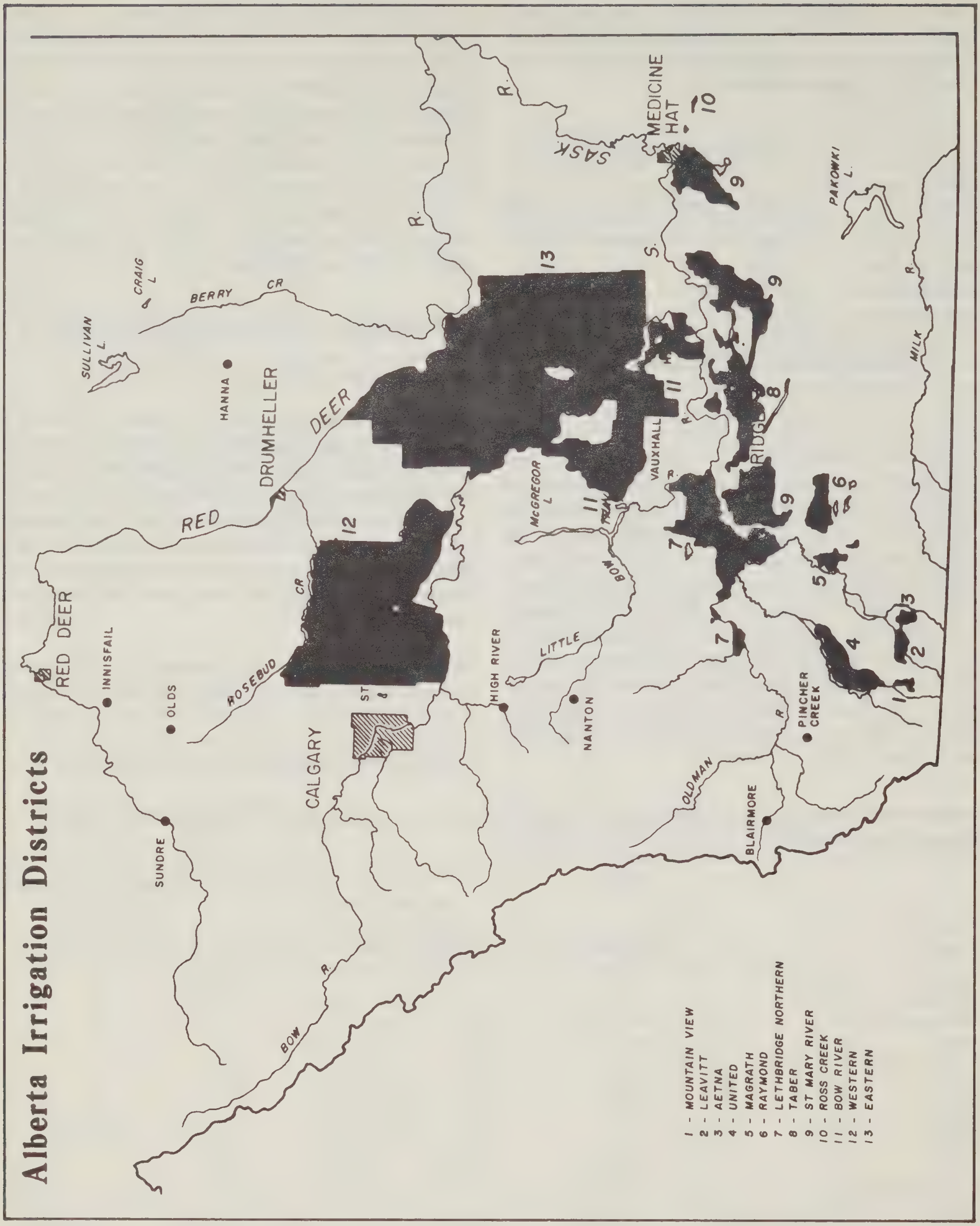

Alberta Irrigation Districts
1 - MOUNTAIN VIEW
2 - LEAVITT
3 - AETNA
4 - UNITED
5 - MAGRATH
6 - RAYMOND
7 - LETHBRIDGE NORTHERN
8 - TABER
9 - ST MARY RIVER
10 - ROSS CREEK
11 - BOW RIVER
12 - WESTERN
13 - EASTERN
RED DEER
INNISFAIL
OLDS
SUNDRE
CALGARY
HIGH RIVER
NANTON
PINCHER CREEK
BLAIRMORE
HANNA
DRUMHELLER
VAUXHALL
MEDICINE HAT
RED DEER
ROSEBUD CR
BOW R.
LITTLE BOW
OLDMAN R.
MILK R.
S. SASK R.
BERRY CR
SULLIVAN L.
CRAIG L.
McGREGOR L.
PAKOWKI L.

Figure 1

temperature during the growing season is about 21°C (70° F). Precipitation averages between 13 and 17 inches a year with about half falling during the growing season (10). Although this is adequate for some crops, it is less than optimum for most, and inadequate for others, especially crops like sugar beets and vegetables. High evaporation rates, due to high winds and warm temperatures, and the incidence of dry years contribute to the problem of inadequate soil moisture. These climatic factors were influential in the establishment of irrigation systems in the area.

The 13 districts account for 98.4 percent of all irrigated land in Alberta. The total irrigable area in 1971 within the districts was 760,798 acres (Table 5). The districts vary widely in size, from 1,512 irrigable acres in the Ross Creek project, to 200,000 acres in the EID.

One measure of the intensity of irrigation within a district is the ratio between irrigated and irrigable acreage. This ratio varies considerably among districts. United, with the lowest proportion of irrigated land, is on the fringe of the irrigation areas. In this area, precipitation is relatively high (over 27 inches annually in some places), the frost-free period is low (90 days) (10), and since much of the area is in the foothill region of the Rockies, the terrain is rough. These conditions also apply to part of the WID. Temperatures are lower, the growing season is shorter, and evaporation is lower than in areas east and south. Forages are the main irrigated crops in these districts. As one moves east, the temperature increases, the growing season lengthens, and, with the addition of water, a wide variety of crops, including high revenue specialty crops can be grown. In these areas the increased demand for irrigation is reflected in the increased intensity of irrigation.

TABLE 5. IRRIGABLE ACREAGE AND ACREAGE IRRIGATED IN ALBERTA'S IRRIGATION DISTRICTS, 1970-71

Irrigation District	Irrigable Acreage[1]	Acreage Irrigated[2]	Percent Irrigated
Eastern	200,000	147,997	73.9
St. Mary & Milk River	191,265	140,146	72.6[5]
Bow River	96,702	73,664	76.1
Lethbridge Northern	89,965	62,725	69.7
Taber	59,350	51,698	87.1
Western	44,000	12,560	28.5
United	33,972	12,828	26.3[6]
Raymond	20,761	8,399	40.4
Magrath	8,506	7,565	88.9
Aetna	6,523	[3]	[3]
Leavitt	4,523	[3]	[3]
Mountain View	3,719	[3]	[3]
Ross Creek	1,512	[4]	[4]
Total	760,798	517,582[7]	68.0

[1] Communication with A. Van Deurzen, Marketing Division, Alberta Department of Agriculture, Lethbridge.
[2] Data for census sub-divisions were used as a basis for these estimates. See Appendix for estimation procedure.
[3] Combined with United District figure.
[4] Combined with St. Mary & Milk River District figure.
[5] Proportion includes the 1,512 irrigable acres from Ross Creek.
[6] Proportion includes irrigable acreage from Aetna, Leavitt, and Mountain View districts.
[7] Total does not correspond with that in Tables 1 and 2 because irrigated acreages are not reported by Statistics Canada where the number of farms with that characteristic is small.

Land Use in the Irrigation Districts

Crop acreages by irrigation districts were estimated from the 1971 Census of Agriculture (Table 6). The method

TABLE 6. IRRIGATED CROPS — AS PERCENTAGE OF DISTRICT IRRIGATED ACREAGE — 1970

Crop	United[1]	Magrath	Raymond	LNID	Taber	SMRID[2]	Bow River	Western	Eastern	Total
	— percent of total district irrigated crop acreage									
Wheat	0.3	0.3	9.4	9.2	7.3	12.9	9.8	1.0	11.5	10.2
Oats	1.7	1.6	7.1	7.0	5.5	6.2	7.4	2.2	8.6	6.8
Barley	3.9	3.6	18.0	17.8	14.0	16.8	18.9	4.4	21.9	17.6
Flax	—	—	3.3	3.2	2.5	6.3	3.5	2.2	4.0	4.1•
Hay	62.3	58.2	24.3	28.2	19.0	23.5	28.6	48.7	29.7	28.2
Sugar Beets	—	7.2	20.8	14.1	23.7	11.4	4.1	—	—	8.2
Potatoes	0.5	—	—	1.8	9.4	2.1	6.1	0.2	3.4	3.6
Vegetables	—	—	0.3	0.1	5.0	1.7	1.0	0.1	0.3	1.2
Improved Pasture	26.4	24.6	11.0	12.7	8.6	10.9	13.6	29.2	13.5	13.0
Other	4.6	4.3	5.4	5.6	4.3	7.8	6.5	11.5	6.7	6.6
Total Acres[3]	12,828	7,565	8,399	62,725	51,698	140,146	73,664	12,560	147,997	517,582

[1] Includes Aetna, Leavitt, and Mountain View districts.
[2] Includes Ross Creek District.
[3] From Table 5

Source: 1971 Census of Canada — Agriculture Data.

of estimation involved correlating census subdivision boundaries with irrigation district boundaries.

The crops listed in Table 6 can be grouped into four principal categories: grain (wheat, oats, barley, and flax); forage (hay and improved pasture); specialty crops (sugar beets, potatoes, and vegetables); and "other". When these groupings are considered, distinct patterns and differences emerge within and among the districts.

Three districts – United, Magrath, and Western – devote very high proportions of their irrigated acreage to forage production. These areas generally have adequate rainfall for cereal and oilseed production. Only one third of the irrigable land in these districts was irrigated. This suggests that irrigation in these districts is supplementary to dryland crop production.

As one moves east where the growing season is longer and warmer, irrigation of cereals becomes increasingly important, so that about equal acreages of forage and grain are irrigated. In the Raymond, LNID, Taber, SMRID, EID, and Bow River districts grains and forages made up between 57 and 89 percent of the irrigated total. Specialty crops (sugar beets, vegetables, and potatoes) accounted for 38 percent of the irrigated acreage in the Taber Irrigation District. Four of the other five districts mentioned above had between 11 and 21 percent of their irrigated acreage devoted to specialty crops. "Other" crops made up the remainder of the irrigated acreage.

Production of Specialty Crops

The so-called "specialty crops" were grown on 13 percent of the irrigated acreage in Alberta in 1970 (Table 6). The major crops in this category are sugar beets, potatoes, peas for processing and corn for processing. In Alberta these crops are grown mainly under irrigation, hence total acreage and production figures for the province adequately describe the situation for these crops in the irrigated area (Table 7). In recent years an average of about 4.6 million cwt. of potatoes was produced on an average of 26,000 acres (75 percent, irrigated land, 25 percent, dryland). Sugar beets have been produced on an average of 40,000 acres a year for the past 15 years. Annual output has averaged about 560,000 tons. The acreage of corn and peas for processing declined steadily through the 1960s. Pea production has, however, been on an upward trend since the early seventies.

All sugar beets produced in southern Alberta are grown on a contract basis and processed locally in refineries at Taber and Picture Butte. Vegetables produced in the irrigation districts are for the fresh, canned, and frozen vegetable markets of Alberta, while potatoes are marketed mainly in Western Canada in a number of forms – fresh, dehydrated, french fried, chipped, canned, or as starch.

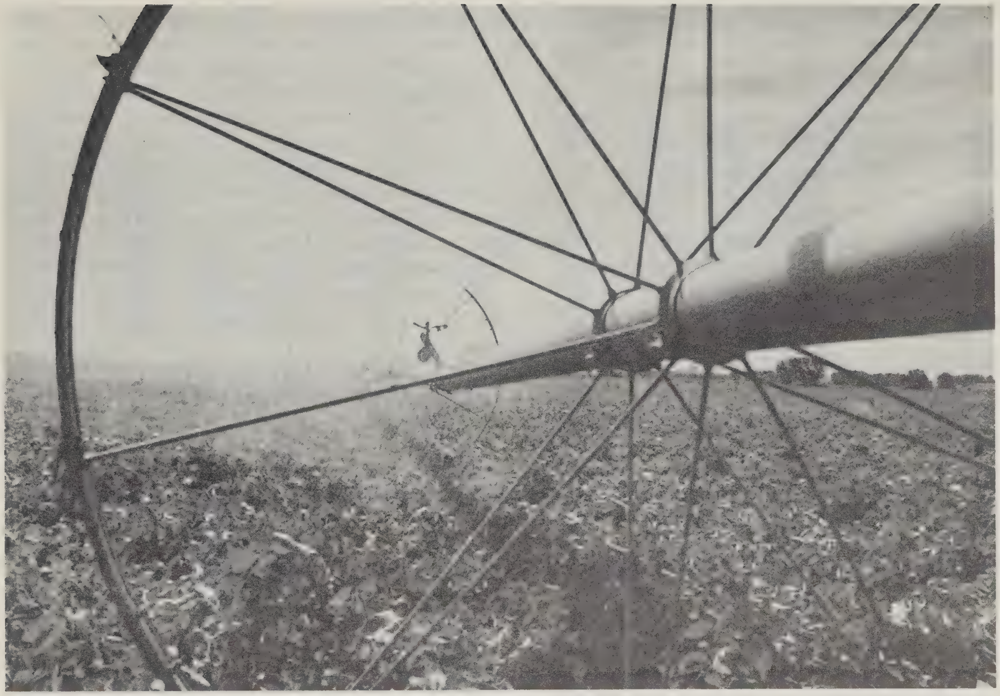
A number of factors combine to limit production of these specialty crops in Alberta. Among them are: the limited market available to vegetable growers; the

TABLE 7. ACREAGE AND PRODUCTION OF SPECIALTY CROPS IN ALBERTA, 1960-63 TO 1973

	Potatoes[1]		Sugar Beets		Peas for Processing		Corn for Processing[2]	
Year	Acres	Production	Acres	Production	Acres	Production	Acres	Production
	'000	'000 cwt	'000	'000 tons	'000	'000 lbs	'000	'000 lbs
1973	23.0	4,500	38.5	580	4.3	13,400	N/A	N/A
1972	23.0	4,100	43.3	657	3.1	9,700	2.1	19,100
1971	26.1	4,000	42.0	684	2.8	9,400	2.6	23,100
1970	32.0	5,700	36.7	523	3.2	9,400	N/A	N/A
1969	27.0	4,500	38.9	576	2.1	6,100	3.0	N/A
1968	24.4	3,300	39.2	596	4.6	13,300	4.0	N/A
1967	22.4	3,200	33.5	434	4.3	10,200	3.9	N/A
1966	25.4	3,907	37.9	575	5.4	14,100	4.3	32,000
1965	23.0	3,000	38.9	504	6.8	18,200	5.0	23,100
1964	21.1	2,429	42.1	526	7.5	15,200	4.8	25,600
1960-63 Average	21.1	2,569	40.2	546	7.4	11,600	5.4	35,200

[1] Total production in Alberta – includes some dryland acreage..
[2] Includes small amount from Manitoba

Source: References (1), (3), (9), (10) and (13).



Sprinkler system

investment required for specialized planting and harvesting machinery; the relatively high per acre cost and, therefore, the high risk involved in producing the crop; institutional and economic considerations related to production contracts and processing capacity. Offsetting these limitations are the relatively high net returns that can be realized from a successful crop.

Gross Returns from Irrigated Crops[6]

Gross receipts from irrigated crops were highest in the SMRID which had over 24 percent of the total receipts in the 13 districts (Table 8). It is the second largest in terms of acreage, but its higher proportion of high revenue specialty crops gave it higher gross returns than the EID, the largest district. Taber, Bow River and Lethbridge Northern districts each contributed significantly to gross receipts (from 12 to 17 percent). Because of its very high proportion of specialty crops, the Taber Irrigation District contributed much more to gross receipts than its acreage would indicate. The remaining districts, with the exception of Raymond, combined low irrigated acreages with primarily supplemental forage irrigation to contribute only minor amounts to the total (less than six percent). Raymond was somewhat different in that it had over 20 percent of its total irrigated acreage devoted to sugar beet production. Raymond, however, had a very small irrigated acreage so its impact on the total was not large. Those districts with the highest proportion of specialty crops have the highest per acre gross receipts.

Livestock on Irrigation Farms

Census data are not sufficiently detailed to ascertain differences in livestock numbers among districts. It is not possible to determine numbers of livestock exclusively on irrigation farms since there is a certain proportion of dryland cropping and forage production on most irrigation farms. In addition, many irrigation farmers lease native range or community pasture.

Census Division 2 in Alberta contains a large proportion of the irrigated area. In 1970, 70 percent of the cattle in Division 2 were on farms and ranches that reported some

[6] The comparisons made in this section on the basis of gross receipts do not imply that the ranking would be the same on a net income basis.

TABLE 8. ESTIMATED GROSS VALUE OF IRRIGATED CROPS BY IRRIGATION DISTRICT, 1970[1]

Crop	United[2]	Magrath	Raymond	LNID	Taber	SMRID[3]	Bow River	Western	Eastern	Total
					— percent —					
Wheat	0.3	0.2	6.2	6.3	3.0	9.1	6.6	1.0	10.2	7.1
Oats	0.8	0.6	2.4	2.5	1.2	2.3	2.6	1.1	4.0	2.5
Barley	2.2	1.8	7.3	7.5	3.5	7.2	7.8	2.6	12.0	7.6
Flax	—	—	1.8	1.8	0.8	3.6	2.0	1.7	2.9	2.4
Hay	52.5	42.2	14.2	17.4	6.9	14.6	17.2	42.0	23.5	17.6
Sugar Beets	—	23.0	54.0	38.3	38.4	31.3	11.0	—	0.1	22.5
Potatoes	4.2	—	—	10.0	31.2	12.1	33.4	2.0	24.3	20.2
Vegetables	—	—	0.8	0.4	8.3	4.7	2.7	0.7	1.3	3.4
Improved Pasture	37.1	29.8	10.8	13.0	5.3	11.3	13.7	41.9	17.8	13.6
Other	2.5	2.0	2.1	2.3	1.0	3.2	2.5	6.5	3.4	2.7
Total ($)	905,720	623,956	899,981	6,162,937	8,280,765	13,589,622	7,222,077	869,046	11,212,470	49,766,571
Gross Value per Irrigable Acre	70.60	84.48	107.15	98.25	160.18	96.97	98.04	69.19	75.76	96.15

[1] The estimates are based on prices, yields, and acreages from references (10), (4) and (2), respectively.
[2] Includes Aetna, Leavitt, and Mountain View districts.
[3] Includes Ross Creek District.

irrigation. Sixty-seven percent of all farms and ranches with brood cows reported some irrigation.

Although the pattern does not hold in every case, the general trend is that areas with higher proportions of forage and feed grains have higher numbers of cattle per farm (Table 9). For example, the United, Magrath, Western, and Eastern Irrigation districts had the highest proportions of irrigated feed grains and forages and also the highest numbers of cattle per farm. Conversely, the Taber and St. Mary's River Irrigation districts had the lowest proportions of feed grains and forages and also the lowest cattle numbers. The availability of dryland range also influences the numbers of cattle owned by farmers in different districts.

SUMMARY

Irrigation farming has been practised in Alberta for almost 100 years, and on an extensive basis for the last 75 years. The major impetus to irrigation development was the arrival of the CPR in the late 1880s and since then irrigation development continued to a point where in 1970 almost 3,700 farms reported an irrigation system. Over 760,000 acres of land were classed as irrigable that year with about 70 percent actually being irrigated. Irrigation farming has been a boon to the local economy and supports various secondary and service industries.

Alberta has over 50 percent of the irrigated acreage in Canada, and leads in the production of most irrigated

TABLE 9. NUMBER OF CATTLE PER FARM, 1970

Irrigation District	Irrigated Forage and Feed Grains as Percent of Total Irrigated Land	No. of Beef Cattle Per Farm	Percent of Irrigated Farms With Brood Cows[1]	Total No. of Irrigated Farms in Each District
United	94.3	148	87	154
Magrath	88.0	222	77	77
Raymond	60.4	128	72	92
LNID	65.7	93	80	481
Taber	47.1	70	79	290
SMRID	57.4	81	67	949
Bow River	68.5	85	76	383
Western	84.5	191	N/A	178
Eastern	73.7	145	81	816

[1] Cows and heifers over 2 years old.

Source: 1971 Census of Agriculture — special run data.

crops, with the exception of tobacco, tree fruits, and vegetables. In terms of acreage, hay is the most important irrigated crop followed by barley and improved pasture. In 1970, Alberta's goods-producing industries had a net value of production of over $3.4 billion. Agriculture accounted for $563 million, or about 16 percent of the total. The average gross return per farm was only slightly higher on farms reporting some irrigation than on dryland farms in the same area. Most farms with irrigated land, however, also have at least some acreage of dryland crops. According to a recent survey, more than 35 percent of all irrigated farms have at least 100 acres of dryland crops.

There are 13 irrigation districts in Alberta, all in the south. These districts account for over 98 percent of the irrigated land in Alberta. In 1971 the total irrigable area in these districts was about 761,000 acres. The districts varied widely in size, from 1,500 to 200,000 irrigable acres. The intensity of irrigation, or the ratio of irrigated to irrigable acres varied widely also, from just over 25 percent to almost 90 percent. The crop mixes within the districts vary also, depending primarily on climatic conditions. Three districts devote very high proportions of their irrigated acres to forage production. As one moves into the heart of the irrigation areas, irrigated cereals and specialty crops become increasingly important.

The gross cash receipts for irrigated crops have been estimated at 20 percent of the total cash receipts for all crops grown in Alberta. The districts with higher specialty crop proportions contribute more on a per acre basis to total cash receipts than do those producing high proportions of forage and cereal crops. Specialty crops accounted for 13 percent of the irrigated acreage in Alberta in 1970. The main specialty crops are sugar beets, potatoes, peas for processing, and corn for processing. These crops are grown mainly under contracts with processing firms.

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APPENDIX

Estimation of Crop Acreages

1. Census Publication no. 96-710 Vol. IV, Part 3 (Bull. 4.3-3) reported acreages for individual crops and total irrigated acreage by census division.

2. Special runs requested from Statistics Canada for farms with irrigated land provided data on total irrigated acreages and crop acreages (dryland and irrigated) by census subdivision. It was assumed that in census subdivisions containing all or part of an irrigation district (or districts) all of the irrigated acreage was within the district boundaries.

3. When two or more districts were within the same sub-division the irrigated acreage was applied to each

in proportion to the area each occupied within the subdivision.

4. The irrigated acreage within the irrigation districts was totaled by census division.

5. It was assumed that all sugar beet, potato, and vegetable acreage in southern Alberta is irrigated. From 2 & 3 above the acreages of these three crops in each district were determined.

6. After the acreages of sugar beets, potatoes, and vegetables were deducted from both the census division and irrigation district totals, the proportion of irrigated acres within each district to irrigated acres within each census division was calculated. Some districts were completely in one census division, some were in two divisions.

7. These proportions were then applied to the individual crop acreages as determined in step 1 to arrive at the figures in Table 6.

COW-CALF PRODUCTION PRACTICES IN SOUTHWESTERN MANITOBA

A survey of cow-calf operators in southwestern Manitoba indicated that 1973-74 winter feeding levels were 50 to 100 percent higher than either National Academy of Sciences (NAS) minimum requirements or Manitoba Department of Agriculture recommendations.

*A.J.J. Laforge and J.K. Wiens**

INTRODUCTION

This is part of a series of studies on beef cattle production in the grain-growing area of the prairies. A random sample of farms was surveyed in southwestern Saskatchewan[1] in 1970 and in the Lloydminster-Battleford area[2] in 1971. The southwestern portion of Manitoba (Census Divisions 4 and 8) was selected for this study to assist with the interdisciplinary work initiated with the Brandon Research Station and to utilize data from an on-going CANFARM project in the area. Census Divisions 4 and 8 occupy 2.7 million acres of farmland with 2.0 million acres improved. Most of this is in the Black Soil Zone.

Annual precipitation fluctuates widely, from 10.24 to 27.87 inches. The average is 17.6 inches.

There were 3,713 farms in Census Divisions 4 and 8 in 1971. Of these, 71 percent or 2,651 farms, had cattle, with an average of 68 cattle per farm.

PURPOSE OF STUDY

The objective of this study was to gather data on cow-calf operations in Census Division 4 in southwestern Manitoba. The primary objective was to obtain data on the amount of winter feed used in the cow-calf enterprise. These data were needed for estimating cost-benefit ratios for pasture development in the prairies. A second objective was to determine whether the records from a CANFARM project would constitute a suitable data source. A third objective was to collect information on other management practices in the beef cattle enterprise for use in interdisciplinary research.

DATA SOURCE

Three sources of cow-calf farm enterprise data were used. These were CANFARM records, a group interview with four area farmers and a survey of 19 cow-calf operators.

The CANFARM project was started in the fall of 1970 in Census Division 4. Its objective was to test the feasibility of collecting farm data from a probability sample using the CANFARM system. This study was extended to Census Division 8 in Manitoba in the fall of 1971. There were 136 farms participating in the project in 1972 and 60 of these had a cow-calf enterprise.

The CANFARM records did not include any information on management practices, calf crop percentage, etc. This

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[1] M.M. Sorboe, Farming in the Cypress Hills Area of Saskatchewan, *Canadian Farm Economics*. Volume 6, Number 6, February 1972.

[2] M.M. Sorboe, An Economic Analysis of Grain-Beef Cattle Farms in the Lloydminster-Battleford Area, Saskatchewan, *Canadian Farm Economics*, Volume 9, Number 2, April 1974.

TABLE 1. COMPARISON OF FARMS ON CANFARM RECORDS IN 1972 WITH 1971 CENSUS DATA FOR CENSUS DISTRICTS NO. 4 AND NO. 8 IN MANITOBA

	Manitoba Census Districts 4 and 8	
	1971 Census	1972 CANFARM Records
Total Number of Farms	3,713	136
Number of Farms Reporting Cattle	2,651	77
Percent of Farms Reporting Cattle	71.4	56.6
Average Number of Cows and Heifers Two Years Old and Over Per Farm Reporting	28.6	46.8[1]
Average Improved Acres Per Farm Reporting More Than 70 Acres	572	832[2]
Average Total Acres Per Farm	728	1,167[2]
Unimproved Pasture Acres Per Farm Reporting Unimproved Pasture	198	–
Average Unimproved Acres Per Farm[3]	192	329[2]
Unimproved Acres Per Farm Reporting Cattle	269	329

[1] For 60 farms with cows.
[2] For 77 farms with cattle.
[3] About 63 percent of the unimproved acreage in these two census divisions was reported as unimproved pasture. The remainder was not used for pasture purposes.

type of information was obtained from a group interview with four area farmers. The farmers interviewed were selected by the local agricultural representative.

The information on feed use was not in suitable form in the CANFARM records. The feed fed was not broken down by class of animal, the number of cattle fed by feeding period, etc. In order to obtain a more detailed breakdown of feed used, the sub-sample of farmers on CANFARM were informed by letter that someone would visit them to collect this data. The farmers were very co-operative.

ANALYSIS OF CANFARM RECORDS

The farms of the CANFARM operators were compared with 1971 census data to determine how representative of the region these farms were in terms of number of cows and improved and unimproved acres, as shown in Table 1. Both the number of cows and acreage per farm were higher in the CANFARM sample than on census farms[3]. The reported improved pasture land per farm reporting such pastureland in the 1971 census was 198 acres. Comparable data were not available from CANFARM records, but unimproved acres for the 77 CANFARM farms with cattle averaged 329. Of the unimproved acreage reported in these two census divisions in 1971, 63 percent was used for pasture. Unimproved acreage was 192 acres per census farm or 269 acres per farm reporting cattle. This was considerably less than the acreage on the CANFARM cattle farms. Seventeen of the cattle farms did not have cows; they were either pasturing calves, or finishing animals in the feedlot.

[3] This was to be expected because of the design of the CANFARM sample.

The sample of 60 CANFARM farms with a cow-calf enterprise was divided into four groups on the basis of size in terms of improved acreage and cow numbers compared to the sample average. The make-up of the four groups and the group averages are given in Table 2. Farms with good physical edit[4] records were selected from each group and their feeding data analyzed. The amount of each kind of feed reportedly used in the

[4] (Optional) feature of CANFARM whereby recording of physical data (lbs, bu, no. of head, etc) is required along with the usual basic data.

TABLE 2. NUMBER OF FARMS, AVERAGE NUMBER OF COWS, AND AVERAGE IMPROVED AND UNIMPROVED ACRES BY FARM SIZE GROUPS

	Farm Size Groups[1]				
	HC-HG	LC-HG	HC-LG	LC-LG	All
Number of Farms	13	7	11	29	60
Average Number of Cows	74.2	26.3	69.6	28.5	47
Average Improved Acres	1,291	1,213	614	529	832
Average Unimproved Acres	476	323	426	259	329

[1] Definitions of abbreviations are:

HC-HG: high cattle, high grain;
LC-HG: low cattle, high grain;
HC-LG: high cattle, low grain;
LC-LG: low cattle, low grain;
where low is below average, and high is above average of the CANFARM sample for each characteristic in Table 1.

TABLE 3. COMPARISON OF FARM SIZE AND FEED USED BY CATTLE AS TAKEN FROM CANFARM RECORDS FOR FARMS IN SOUTHWESTERN MANITOBA

	HC-HG[1]	LC-HG	HC-LG	LC-LG
Number of farms	5	3	5	6
Average number of cows	85.6	38.7	56.2	27.2
Number of animal units	131.4	52.8	81.7	42.3
A.U. per cow	1.54	1.36	1.45	1.56
Improved acres	1,395	1,503	640	512
Unimproved acres	393	393	222	156
Oats per A.U. (lbs.)	1,232	1,164	1,084	947
Barley per A.U. (lbs.)	715	761	569	1,066
Hay per A.U. (tons)	1.89	1.87	1.99	1.15
Straw per A.U. (tons)	.35	.77	1.07	.42
Est. TDN[2] per A.U. (lbs.)	3,510	3,813	3,981	2,888
Est. TDN per A.U. (excl. straw)	3,230	3,197	3,125	2,552

[1] Two of the five farms were two-operator units.
[2] Estimated on basis of TDN values in Table 6.

cattle enterprise is shown in Table 3. The cattle enterprises consisted of cows, calves, feeders and, in some cases, finished animals; therefore, these cattle were aggregated into animal units (A.U.)[5]. The HC-LG farms used more straw and hay and less grain per animal unit than the HC-HG and LC-HG farms. The smallest farms (LC-LG) fed the least amount of feed but the most grain per animal unit. The level of feeding per animal unit seems high considering that three groups (HC-HG, LC-HG, HC-LG) fed 22, 32 and 38 percent more TDN than the fourth group (LC-LG). If the assumption was made that none of the straw was consumed by the cattle involved, the three groups still fed 22 to 26 percent more energy than the fourth group. Some of the variations could be due to weights used for aggregating the various classes of livestock into animal units. Younger animals do not have a well-developed rumen, so it was not possible to estimate TDN levels from forages and straw for such animals. There was a different mix of livestock in each group as measured by the number of animal units per cow. It was therefore decided that data on an animal unit basis was not satisfactory and that information on feeding beef cows separately should be obtained.

Other reasons for variations in feeding levels among various farms include differences in the length of the feeding period and difficulties in transferring crop products to livestock inputs.

[5] One cow = 1.0 A.U., one bull = 1.5 A.U., one 1-2 year old heifer = 1.0 A.U., one steer or heifer less than one year old = 0.66 A.U. and one calf = 0.25 A.U.

GROUP FARM INTERVIEW RESULTS

The results of a group interview depend on several factors, the most important being the knowledge that the interviewers and interviewees had about the subject, Others factors include local agricultural practices, and length of the interview.

The four interviewees selected by the local agricultural representative were not part of the CANFARM sample. They were young farmers who were familiar with agriculture in the area.

The objective of the interview was to obtain information about the cow-calf enterprise on LC-HG farms, the size group to which the interviewees belonged. The farmers had difficulty thinking in terms of their own size group. Because only three hours were allocated for the interview and because of the number of questions to be asked, it was decided to discuss averages for all farms in the area.

The farmers were knowledgeable about most aspects of the cow-calf enterprise except for winter feed. Although they were able to indicate the feed they used on their own farms, they had not observed what others fed. They made the following observations:

(1) Almost all bulls were British breeds or Charolais, but a few farmers had half-cross exotic bulls. Artificial insemination was not commonly used because of previous poor results (low conception rates);

(2) In the recent past, farmers recovered the original cost of their bulls at selling time from weight gain and a higher price per unit;

(3) There were many calving problems in the area;

(4) Calf crops (percentage weaned) were as low as 80 percent. This was due to cows' failure to conceive, abortions and deaths between birth and weaning;

(5) Not all calves were wintered by farmers who raised them, and very few were finished by farmers who raised them;

(6) Of those farmers feeding calves, 70 percent ground or chopped the forage. All operators feeding calves fed grain along with the forage;

(7) Urea was not used as a protein supplement;

(8) Cow culling rates of 15 to 20 percent were common;

(9) Older farmers tended to have no cattle or smaller herds;

(10) Ninety percent of cattle farmers had front-end loaders and 80 percent of their use was in the cattle enterprises;

(11) About 70 percent of cattle farmers had mowers and rakes, but these implements would not be replaced when fully depreciated as swathing had become the usual method of cutting hay even for those farmers owning mowers and rakes;

(12) Fifty percent of the hay crop was baled in normal rectangular bales compared to 90 percent two years before. Balers making large round bales were becoming common;

(13) Considerable sweet clover, about 30 percent of the forage supply in the area, was harvested for silage;

(14) Manure was removed from farmyards by custom operators;

(15) Almost all cow-calf operators wintered their cows in open sheds;

(16) Underground water was available from wells 25 to 30 feet deep;

(17) Very little cultivated acreage was used for pasture, but not all unimproved land was used for pasture. Most hay was tame and some slough hay was harvested when possible;

(18) Seventy percent of the calves and feeders were sold through the local auction market and the remainder were sold to neighbors;

(19) Farmers did not use the Winnipeg Commodity Exchange to hedge against price changes;

(20) Most farmers fed their cows so that they would not weigh less after calving than they weighed coming off pasture the previous fall.

FARM SURVEY RESULTS

More detailed information from 18 farmers enrolled in CANFARM in Census Districts 4 and 8 was obtained to document the feeding level of beef cows during the winter of 1973-74 (see Table 4). These farmers were not necessarily the same as those of the small select sample in Table 3. The farmers were notified that someone would visit them to collect data on winter feeding levels for their beef cows and thus it is expected that good estimates were obtained. Data were gathered only from farms where beef cows were fed separately from other cattle. Farms where there was also dairying were not included in the tabulation of data. Table 4 shows the levels of hay, straw and oats fed per cow as well as the number of days fed; all information is provided by size of operation. The first permanent snowfall in the fall of 1973 came on November 1, which was sooner than usual, but several operators reported feeding up to one

TABLE 4. SURVEY RESULTS OF FEED FED PER COW BY SIZE OF HERD AND GRAIN FARM IN SOUTHWESTERN MANITOBA, WINTER OF 1973-74

	Unit	HC-HG	LC-HG	HC-LG	LC-LG
Number of farms		5	4	4	5
Hay	Tons	2.622	2.690	1.838	2.691
Straw[1]	Tons	.541	.180	.782	.611
Oats	Pounds	354	984	1,508	971
Days on Feed		214	205	216	203
Days on Feed and Pasture		6	23	19	0
Estimated TDN[2]	Pounds	3,292	3,493	3,473	3,839
Percent of NAS[3] Requirements		176	187	186	205
Excluding Straw					
Estimated TDN	Pounds	2,876	3,398	2,924	3,390
Percent of NAS Requirements		154	182	156	181

[1] Does not include straw used only for bedding, but some of the straw fed may have been used for bedding.
[2] Based on TDN estimates from Table 6.
[3] National Academy of Sciences.

month before that date. Only one operator did not start feeding until November 15. When the survey was conducted at the end of March 1974, some farmers said they would be feeding until May 1, some until May 15 and others until June 1. Feed consumption estimates summarized in Table 4 include data for cattle feeding supplementary to grazing at the beginning and the end of the winter feeding period.

The NAS recommends 8.36 pounds of TDN per day for the maintenance of an 1,100 pound dry pregnant beef cow and 12.32 pounds of TDN per day for an 1,100 pound cow nursing a calf[6]. If an 1,100 pound beef cow is fed for 150 days at the first TDN level and 50 days at the second level, the total TDN fed would be 1,870 pounds.

Table 5 shows the feeding levels for wintering beef cows, as recommended by the Manitoba Department of Agriculture. These levels are slightly higher than the NAS levels. Nevertheless, neither level is nearly as high as those actually fed by the farmers surveyed. The more standard rations 1 to 3 are 3.4 to 4.9 percent greater in energy than the NAS minimum levels.

[6] The minimum maintenance requirement was confirmed by a University of Alberta study in which 1,115-lb cows were fed a 43.5 percent TDN (90 percent dry matter basis) ration with varying protein levels and processing methods for 112 days starting December 5, 1973. These cows were not provided with shelter or bedding; however, there was considerable bush in their pasture lot. Of the three groups that consumed less than 8.36 pounds of TDN, two lost weight. All those consuming more than 8.36 pounds of TDN per day gained weight.

The feeding recommendations are considerably lower than the feeding levels reported by farmers in the survey. The group at the lowest level (LC-LG) fed 76 percent more than NAS requirements for 200 days. However, almost all farmers fed beyond 200 days, but in most cases calving would have occurred less than 50 days before the cows were put to pasture. If all straw reportedly fed is assumed to be used for bedding, the percentage of overfeeding is reduced to 55 percent for the larger cow-calf operators and to 81 percent for the smaller operators. The amount of grain fed was high for all groups except the HC-HG group, which fed only 354 pounds of oats per cow. This is about the level recommended by the Manitoba Department of Agriculture (see Table 5). The data for LC-LG farms were in complete contrast to the data from CANFARM, where the least amount per animal unit was fed.

IMPLICATIONS

Some farmers fed 50 percent more for the winter months than NAS minimum requirements for a full year. Usually, an 1,100 pound cow could not consume the amount of feed reportedly fed, and thus it is possible much of the hay and straw would either be wasted or used for bedding. Farmers may not be accurately estimating the weight of hay and straw fed.

Farmers may use more feed than required in winter because: (1) protein in the feed is so low that the least-cost ration is one with excess energy; (2) winter feed was a cheaper feed source than summer grazing; (3)

TABLE 5. SIX COW-WINTERING RATIONS AND ESTIMATED TDN AS RECOMMENDED BY MANITOBA DEPARTMENT OF AGRICULTURE

		Ration[1]					
Feed	Unit	1	2	3	4	5	6
Hay	Tons		1.52				
Haylage	Tons			2.91			
Native Hay	Tons	1.96					
Straw[2]	Tons			.52			1.49
Corn Silage	Tons					4.60	
Barlage	Tons				3.23		
Barley[3]	Pounds	248	248	248	199	350	1.341
Urea[4]	Pounds					45	27
Limestone[5]	Pounds						25
Estimated TDN[6]	Pounds	1,945	1,933	1,962	1,845	2,129	2,158

[1] The rations are fed for 150 days at low energy levels and for 50 days at higher energy levels. In rations 1 to 5 barley is fed only in last 50 days; in ration 3 straw is fed only in the first 150 days. In ration 6 barley is fed at 5 pounds per day for 150 days and at 12 pounds per day for 50 days.
[2] In addition to .8 tons of straw for bedding.
[3] Barley fed for 50 days after calving except in ration 6.
[4] Urea fed with barley or corn silage only.
[5] Limestone fed after calving only.
[6] Based on TDN estimates from Table 6.

Source: Manitoba Department of Agriculture, Beef Manual.

TABLE 6. TDN LEVEL OF FEEDS LISTED IN TABLES 3 to 5

Feed	Dry Matter	Estimated TDN
	– percent –	
Alfalfa hay		50
Brome hay		50
Native hay		45
Straw		40
Barley straw[1]	88.2	36
Oat straw	90.1	45
Barley (Can. No. 1 feed)[1]	86.5	72
Oats (Can. 2CW or No. 2 Feed)[1]	86.5	67
Wheat (Can. No. 4)[1]	86.5	76
Dehydrated alfalfa	93.1	55
Haylage (40 percent DM)		23.5
Barlage (40 percent DM)		26.4
Corn silage (30 percent DM)		20.4

[1] Source: National Academy of Sciences, *United States – Canadian Tables of Feed Composition,* Publication 1684, 1969.

they may once have shipped cream and switched to beef without modifying their feeding practices, and (4) NAS standards may not be completely applicable to the local weather conditions.

Farmers do not have sophisticated equipment to mix least-cost rations for their cattle enterprises. Such equipment requires large scale operations to be economical. Therefore, even though cheap sources of protein may exist, the lowest cost method of feeding can be to use a given feed at a level that furnishes at least the minimum requirements of all nutrients. Farmers is the study area were, however, not doing this; they were feeding hay at levels that would satisfy most nutritional requirements unless the quality was very poor. In most cases, they were feeding cereal grains without feeding straw. In many instances, soybean oil meal mixed with some grain would have been a cheaper source of protein supplement than all grain, but farmers do not like to purchase inputs when they already have them. The level of crude protein required in a ration for a dry pregnant cow is only 5.9 percent, and this level exists in most feed sources except straw and poor quality slough hays. A farmer's uncertainty of the protein or energy content of a particular feed may explain the higher feeding levels.

There could be sound economic reasons for such high levels of feeding. Possibly, the reason farmers use more feed than appears necessary according to NAS standards in winter is that it is cheaper than summer grazing. The number of days these farmers fed their cows may indicate this to be the case. Native pasture has been changing owners at very high prices in recent years and winter feed with forage, straw and grain harvested from arable lands may have been cheaper than summer pasture[7].

In areas of relatively high seasonal rainfall (more than 10 inches), the amount of forage harvested can be double the amount of forage obtained through pasturing. Bailey (1) estimates that forage production is reduced by 30 percent because of grazing at non-optimal times and "the grazing animal does not eat all forage on properly managed pastures; thus the quantity of forage consumed is reduced a further 20 percent." (1, p. 131). Assuming double the yield of dry matter from hay compared to pasture and assuming fencing costs for year-round drylotting equal to fencing costs for the traditional pasture and winter feeding methods, it is as economical to drylot beef cows year-round when the cost of harvesting and feeding a unit of dry matter is equal to the value of the unit of dry matter standing in the field.

Former dairy farmers now with beef herds should be provided with information on the feeding levels of beef cows. Extension programs could be designed to give advice on feeds to individual farmers after determining the needs of the farmers.

Farmers are probably reluctant to have their cattle suffer from cold stress during the winter and hence they feed more than is necessary at all times.

SUMMARY AND CONCLUSIONS

CANFARM records were inadequate for estimating detailed physical quantities of inputs used for the cow-calf enterprises. This is because the physical edit on the CANFARM system is for a cattle enterprise.

The four farmers interviewed as a group were very helpful in establishing the production practices followed by cow-calf operators in their area. However, they were not able to indicate the amount of feed used for the wintering of beef cows.

The farm survey of cow-calf operators in southwestern Manitoba indicated that in the winter 1973-74 feeding levels were 50 to 100 percent higher than either NAS minimum requirements or Manitoba Department of Agriculture recommendations.

[7] The investment cost of $50 per-acre native pastureland at 10% interest is $5 an acre. The land investment per cow-month of grazing would be $15 at a grazing intensity of 3 acres per cow-month ($90 a cow for a six-month grazing period).

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3. Graham, J.D. and G.R. Winters, A Spatial Model for Analysis of the Canadian Livestock Feed and Livestock Product Sector, paper presented at CAES Workshop, Carleton University, August 1974.

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6. University of Alberta *Fifty-Third Annual Feeders Day Report* June 10, 1974.

POLICY AND PROGRAM DEVELOPMENTS

FARM CREDIT ACT – Amendments

Amendments to the Farm Credit Act that increase the funds available for farm loans and raise the ceiling on loans to young farmers became law on May 9. The ceiling on loans to young farmers, those under 35, is raised from $100,000 to $150,000. This group will also benefit from a provision that enables the Farm Credit Corporation to lend above the former level of 90 percent of the productive value of land, livestock and equipment.

Changes in the act will also help young people whose principal occupation is not farming to get into farming over a period of up to five years. Previously the F.C.C. could lend only to those who are principally occupied in farming.

Part of the amendments that can benefit all farmers gives the F.C.C. authority to secure loans with other than first mortgages, and the F.C.C.'s capital is raised from $66 million to $100 million, which increases the Corporation's power to borrow from the federal treasury.

TWO-PRICE WHEAT ACT (Bill C-19)

The Two-Price Wheat Act received Royal Assent on June 19 and was scheduled to come into force on July 1, 1975.

The two-price wheat program originally announced on September 12, 1973, established a fixed ceiling price for wheat milled in Canada of $3.25 a bushel for top grade bread wheats and $5.75 a bushel for durums. The Government agreed to pay producers the difference between these prices and the export price up to a maximum payment of $1.75 a bushel. The agreement runs until July 31, 1980. During this time producers are guaranteed a return of no less than $3.25 a bushel on all wheat milled for domestic human consumption.

Payments to cover the Government's commitment under this program will be made to Canadian wheat producers in July, when the act comes into force. The first payment applies on wheat sold before July and will include interest. Once the act is proclaimed, the Government will make monthly payments based on domestic millings.

PROVINCIAL MILK MARKETING LEVIES

(Under the Federal Agricultural Products Marketing Act and Provincial Milk Marketing Orders. Canada Gazette, May 14 and 28, 1975.)

All provinces except Newfoundland have authority, through their own milk marketing boards, to regulate the marketing of milk in their respective provinces, and the Canadian Dairy Commission (C.D.C.) delegates to them the power to collect levies from milk producers within the province. Most provincial boards regulate both milk and cream. Ontario has a separate board for each.

The levy is paid on all milk, butterfat or over-quota cream going into manufacturing processes. The money collected is remitted to the C.D.C. to equalize the domestic support price and the world price for skim milk powder. It provides the assistance needed in the export of this product for sale abroad.

In April, 1975, the C.D.C. increased the levy rates on milk, butterfat and over-quota cream. Levy orders to provinces were amended accordingly.

As published in the Canada Gazette, the new levies to be collected by Prince Edward Island, Quebec, Ontario, Manitoba, Alberta and British Columbia are as follows (previous figures in brackets):

Within-quota milk	45 cents each 100 pounds (15¢)
Within-quota butterfat	$0.1286 each pound ($0.0249)
Over-quota milk	$4.00 each 100 pounds ($1.50)
Over-quota butterfat	$1.14 each pound ($0.4286)
Over-quota cream	50 cents each pound (22¢)

The provincial boards responsible for milk marketing are:

Nova Scotia Milk Commission
New Brunswick Milk Commission
Prince Edward Island Milk Market Sharing Quota Commodity Board
Fédération des producteurs de lait industriel du Québec
Fédération des producteurs de lait du Québec
Ontario Milk Marketing Board
Ontario Cream Producers' Marketing Board
Manitoba Milk Producers' Marketing Board
Alberta Milk Control Board
Saskatchewan Milk Control Board
Milk Board of British Columbia

CROP INSURANCE ACT

Some changes in the Federal-Provincial Crop Insurance Agreements became effective for the 1975 growing season:

British Columbia Crop Insurance Agreement

Berry program: Premium rates for blueberries revised to reflect recent losses. Unit prices for strawberries and strawberry plants increased.

Grain program: Premium rates increased to reflect recent losses and to provide additional benefits of hail and/or fire spot-loss coverage. Coverage level of 70 percent of average yield added for rapeseed. Unit prices for barley, oats and rapeseed increased to conform more closely to market prices.

Grape program: Value of vines and vine tops increased. Coverage at 70 percent of average yield now available.

Tree fruit program: Premium rates for cherries revised to provide for additional benefits and to reflect recent losses. Losses due to rain-split in cherries and plums adjusted on a spot-loss basis. Higher unit prices available for all fruits. Insurable tree values increased.

Alberta Crop Insurance Agreement

Premium rates and coverages revised to reflect recent losses. Winter wheat, mixed grain, mustard and spring rye now included as insurable crops. Higher unit prices available. Snowed-under crops eligible for payments on a spot-loss basis. Insurance available on unseeded summerfallow acreage. The coverage adjustment schedule is revised to provide higher maximum coverage for favourable experience (a specified period of non-claim years).

Saskatchewan Crop Insurance Agreement

Premium rates and coverages for wheat and barley revised to reflect recent losses. The unseeded summerfallow acreage insurance program revised, and coverage increased. Coverage on stubble crops in relation to coverage on summerfallow crops for wheat and barley revised.

Manitoba Crop Insurance Agreement

Premium rates and coverages revised to reflect recent losses. Insurance now available on forage crops (grasses, alfalfa, alfalfa-grass mixtures). Unit prices increased for all crops and for unseeded acreage.

SASKATCHEWAN HOG MARKETING REGULATIONS

(Under the Agricultural Products Marketing Act and the Saskatchewan Hog Order (Section 3) Canada Gazette May 14, 1975.)

These new regulations apply only to the marketing of hogs in the interprovincial and export trade, and to persons and property in the province.

Saskatchewan Hog Marketing (Interprovincial and Export) Regulations

Producers may sell hogs only to the Saskatchewan Hog Marketing Commission or, by exemption, to a small processor (defined as one who in the previous calendar year has processed less than two percent of all hogs slaughtered in the province), to a consumer for his own consumption, to another producer, or to a processor chosen by the Commission to provide research data. Exemptions apply also to certain classes of hogs: breeding stock, weanling pigs, feeder pigs and boars. Methods of payment to producers are described.

Saskatchewan Hog Licensing (Interprovincial and Export) Regulations

Purchasers, processors, assembly yard operators and truckers engaged in the transport of hogs, must be licensed by the Commission. Licence fees are set at $20 for purchasers, processors and operators, and at $10 per vehicle for truckers. Requirements of assembly yard operators are listed.

Saskatchewan Hog Service Charge (Interprovincial and Export) Regulations

A service charge of 50 cents for each hog marketed for slaughter is payable to the Commission by every producer. Method of payment is described. Exemptions from these Regulations include producers who hold dispensation certificates, who slaughter hogs for their own consumption, who sell a hog for consumption by the buyer, who market breeding stock, weanling pigs, feeder pigs or boars, or who sell a hog to provide research data.

Saskatchewan Hog Farm Registration (Interprovincial and Export) Regulations

A producer may market hogs only if he has been allocated a farm unit registration number by the Commission. A producer may apply for a number as he

markets his first shipment of hogs through the Commission.

Saskatchewan Hog Information (Interprovincial and Export) Regulations

Lists requirements for keeping books and records on all matters relating to hog marketing, for inspection of premises, and for weekly statements by small processors and operators of assembly yards.

FEED GRAIN RESERVE STOCK REGULATIONS

(Under Appropriation Act No. 4, 1974. Canada Gazette May 14, 1975.)

Established the Reserve Stock Management Committee, whose chairman and members are nominated by the Canadian Livestock Feed Board, the Canadian Grain Commission and the Canadian Wheat Board.

It authorizes the Committee to establish and maintain at Thunder Bay and Halifax a reserve stock of feed grain. This may be made available to (a) persons who cannot meet commitments for delivery of feed grain in Canada; (b) feeders of livestock or poultry, or manufacturers of grain feed for livestock or poultry, in areas where supplies of feed grain are inadequate to meet the demand.

The reserve stock shall consist of not more than ten million bushels of grain. Of this, not more than three hundred thousand bushels shall be held at Halifax, between October 1 and May 1 in a crop year, the rest to be held at Thunder Bay.

The Committee's duties respecting the release of grain, and the conditions under which grain may be released, are listed.

The Committee may, when satisfied that it is advisable to do so, release feed grain from the reserve to the Canadian Wheat Board for export from Canada.

POTATO STABILIZATION ORDER, 1975

(Under Agricultural Stabilization Act. Canada Gazette May 28, 1975.)

This order provides authority to stabilize the price of potatoes grown in Eastern Canada in 1974 and available to be marketed in 1975.

The regulations prescribe prices of 114.5 percent of the base price (10-year average) for potatoes sold on the table (or fresh) market and those sold to processors, and of 74.4 percent of the base price for those used for other purposes (such as starch-making or livestock feed).

Payments to producers for potatoes meeting grade standards are set at $1.67 a hundredweight for those sold on the table market, 77 cents a hundredweight for those sold to processors, and $1.80 a hundredweight for all other sales.

Under the original potato assistance program, announced last April, federal stabilization payments on potatoes used for livestock feed were available only to producers in New Brunswick, Prince Edward Island and eastern Quebec. Now all Eastern Canadian growers may receive the $1.80 per hundredweight for livestock feed, based on Canada No. 1 grade. Eastern producers are limited to stabilization payments on a maximum of 10,000 hundredweight, whichever market they sell to.

EGG MARKETING LEVIES

(Under the Agricultural Products Marketing Act)

Quebec Egg Order

In force June 12, before publication in the Canada Gazette. Replaces the Quebec Eggs for Consumption Producers' Marketing Order (1966).

An agreement by which the Eggs for Consumption Producers' Federation of Quebec (Fédération des producteurs d'oeufs de consommation du Québec) pays the Canadian Egg Marketing Agency for hens or dozens of eggs that are in excess of the adjusted total allocation for Quebec. It gives the federation federal authority to impose and collect a levy on producers for over-quota eggs, and to regulate the movement of eggs in interprovincial and export trade. (Such authority has already been granted under the Agricultural Products Marketing Act to Alberta, Saskatchewan, Ontario, New Brunswick and Nova Scotia.

New Brunswick Egg Order (Canada Gazette May, 28, 1975)

Grants the New Brunswick Egg Marketing Board authority to impose and collect levies on producers of eggs, and to regulate the marketing of eggs in interprovincial and export trade.

AMENDMENT TO SEED VARIETIES ORDER

(Under the Seeds Act. Canada Gazette June 11, 1975.)

This amendment removed three varieties of rapeseed from sale in Canada: Arlo, Echo and Polar. They were

found to contain unmarketable levels of erucic acid, too high for human consumption and too low for industrial use. The deletion of these varieties was agreed on by the Rapeseed Association of Canada, plant breeders, seed growers, the seed trade and provincial departments of agriculture.

FEED GRAIN (EASTERN CANADA) ASSISTANCE REGULATIONS, 1975

(Under the Livestock Feed Assistance Act. Canada Gazette May 14, 1975.)

The Canadian Livestock Feed Board was given authority by these regulations to make payments to livestock feeders in Eastern Canada with respect to feed grain from the West that was unloaded at Prescott, Ontario, in April of 1975, and shipped overland to Montreal. Payments were made to compensate for extra costs of transporting the grain from Prescott, an emergency action made necessary by a strike that closed the port of Montreal. By late June payments were still being made on the basis of substantiated claims submitted to the Board.

SLAUGHTER COW STABILIZATION REGULATIONS 1974-75

(Under Agricultural Stabilization Act. Canada Gazette May 28, 1975.)

These regulations prescribe the price for a slaughter cow as 124 percent of the base price (that is, the average price over ten years).

Payments made by the Agricultural Stabilization Board to a producer (under paragraph 10 (1)(b) of the Act) apply only to (1) Grades D1, D2, D3 and D4 cows, (2) according to the quota delivery system determined by the board, and (3) to a cow sold for slaughter between November 16, 1974 and April 30, 1975.

The stabilization period extended from December 14, 1974 to April 30, 1975. In that period five percent of a producer's herd was eligible, but not more than two percent could be slaughtered in a month. (For a retroactive period, November 16 to December 13, payment was made on all cows slaughtered.) Owners of small herds may receive the deficiency payment on a minimum of two cows slaughtered, regardless of the size of the herd.

PUBLICATIONS

Readers: when ordering publications, please write to the source indicated under the appropriate section.

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Available from Publications Manager, Economics Branch, Agriculture Canada, Ottawa, K1A 0C5.

Handbook of Food Expenditures, Prices and Consumption. D. Champagne and Z.A. Hassan, Publ. 75/6. May 1975. 87p. Bilingual.

Beef Cattle and Hog Outlook. A.M. Boswell and L.D. Smith. June 1975. 37p.

Provincial Legislation Pertinent to Agriculture: Newfoundland, Nova Scotia, New Brunswick. A.R. Jones. Publ. 75/7. 29p.

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AGRICULTURE CANADA PUBLICATIONS

Available from the Information Division, Agriculture Canada, Ottawa, K1A 0C7.

Hedges for Canadian Gardens. Ottawa 1973, revised 1975. 33p. Tables, figures. Paper cover. (Publication 899). Also French.

Canadian Plant Disease Survey. Issued by the Research Branch. Quarterly. 27cm. Paper cover. Vol. 54. No. 4, December, 1974. Pp. 105-170. A-47-3/54-4. Free.

Swine Vesicular Diseases. Ottawa, 1975. Folder. Illus 22cm. (Publication 1550). (Also French). A63-1550. Free.

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Order by name of province from Canadex in the Department's Information Division. (B.C. not yet available).

STATISTICS CANADA PUBLICATIONS

Available from the Publications Distribution Unit, Statistics Canada, Ottawa, K1A 0T7.

Wool Production and Supply, 1974. Ottawa, 1975. Tables. 28cm. Bilingual. 2p. Prepared in the Livestock and Animal Products Section, Agriculture Division. CS23-205/1974. 35¢ per copy.

Dairy Statistics 1974. Ottawa, 1975. 23p. Tables, graphs. 28cm. Bilingual. Prepared in the Livestock and Animal Products Section, Agriculture Division. CS23-201/1974. 70¢ per copy.

Basic Socio-economic Characteristics of Farm Operators Canada and Provinces. Ottawa, 1975. Various paging. Tables. CS96-712. $1.05 per copy.

MANPOWER AND IMMIGRATION

Available from Information Service, E.A. Bourque Memorial Building, 305 Rideau St., Ottawa, K1A 0J9.

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Available from Information Canada, 171 Slater St., Ottawa, K1A 0S9.

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HOUSE OF COMMONS

Farm Credit Act. An Act to amend. As passed, April 10, 1975. 11p. XB301-34/3. 25¢ per copy.

Index to the House of Commons Debates. 1st session, 30th Parliament, 23 Elizabeth II, 1974-75. 26cm. Paper bound. Vol. 119, No. 4, (unrevised) September 30, 1974 – March 26, 1975. X3-301/1974-4. $1.00 per session.

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Standing Committee on Agriculture. 1st session, 30th parliament, 23-24 Elizabeth II, 1974-1975. Chairman: The Honourable Hazen Argue. YC25-301/1-11. 20¢ per copy.

Complete Proceedings on Bill C-10. An Act to amend the Prairie Grain Advance Payment Act. No. 11, Thursday, March 20, 1975. 9p. YC25-301/1-11. 20¢ per copy.

PUBLICATIONS OF INTERNATIONAL ORGANIZATIONS

ORGANIZATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD)

Available from Information Canada, 171 Slater St., Ottawa, K1A 0S9.

Milk and Milk Products Balances in OECD Member Countries. 1960-1973. Statistical data for some 25 countries including Canada. 1975. 163 p. Tables. 32cm. Paper bound. Bilingual.

Annual Reports on Consumer Policy in OECD Member Countries. 1974. 107p. 29cm. Paperbound. (Also French). 32-02858-0. $4.25.

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Evaluations of Some Perticide Residue in Food. 1973. No. 3. WHO pesticide Residues Series. 1974. 491p. Tables. 24cm. Paperbound. 23-02441-0. $7.35.

Agricultural Policy in Germany. 1974. 60p. Tables, graphs. 24cm. Paperbound. (Also French). 32-02824-5. $3.50.

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DEFINITIONS

The following definitions are provided to help readers better understand the articles in this issue:

Article No. 1

AMINO ACID – organic compounds of carbon, hydrogen, oxygen and nitrogen. Some also contain sulphur. Many amino acids linked together in some definite pattern form a molecule of protein (beads on a chain).

Article No. 2

VITREOUS – having the nature of, or like glass; glassy.

GLUTEN – a gray, sticky, nutritious protein substance that gives dough its tough, elastic quality.

Article No. 3

NET VALUE OF PRODUCTION – the value added to the total worth of the product at each step in the productive process.

DRYLAND FARMS – farms with no irrigation system or supplemental water added.

Article No. 4

TDN – total digestible nutrients – a measure of the energy concentration in a feed.

IN REPLY

Ralph Luimes of Chesterville, Ontario, writes "CFE Magazine has been very interesting to me and I ask that I be placed on the mailing list. I am a Grade 12 student interested in agriculture as an occupation." He asks about published information that could help a young person to get started in farming. The editor has answered Mr. Luimes directly, telling him of a projected publication by CDA that would contain such information.

Thanks to Georges Bélanger, agronomist and research assistant of St Hyacinthe, Quebec, for complimentary remarks on the French edition of CFE. And to John Derworiz, a farmer in Yorkton, Saskatchewan, who says he gives copies of CFE to his neighbours. And to the economist in St. Cloud, France, who wrote approvingly in response to articles in the February issue.

J.A. Pierce, a corporate planner with John Labatt Ltd. in London, Ont., commended the "well-documented history on petroleum products and electricity leading to a rational outlook" in CFE for February.

The editor values these comments. Thanks to all who write.

IN REPLY TO AUTHORS AND EDITORS REGARDING JUNE 75 *CANADIAN FARM ECONOMICS*

I have read the following article(s):

(1) The Potato as a World Food Source
(2) Canadian Durum Wheat: Its Role in the World Food System
(3) Irrigation in Canada: Alberta's Role
(4) Cow-calf Production Practices in Southwestern Manitoba

My comments are on article number

This article was: not useful 1 2 3 4 5 6 7 8 9 10 very useful.

Because (e.g., The most important economic and social factors were studied. The work was well documented and the conclusions were useful to me).

Beefs Bouquets (Suggestions to authors, publications committee and editors)

My comments may ( ) may not ( ) be used in a future issue if the editor wishes.

NAME (Please print) . . . . Occupation . . . .

ADDRESS . . . .

Please place this sheet in an envelope and address it to:

IN REPLY,
Att: John McConnell,
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Agriculture Canada,
Sir John Carling Building,
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CANADIAN FARM ECONOMICS

Agriculture Canada

HON. EUGENE WHELAN, MINISTER — L. DENIS HUDON, DEPUTY MINISTER

Canadian Farm Economics is published bi-monthly by the Economics Branch, Canada Department of Agriculture, Sir John Carling Building, Ottawa, and is based on material prepared by economists of the Economics Branch.

Purpose: To provide current information on agricultural economics for economists, representatives of extension, education, press, agri-business, trade, foreign offices, bio-physical and social science researchers, administrators, librarians and leading farmers.

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Letters from readers: Letters are encouraged and should be addressed to the author or the Managing Editor. Responses . . . comments, suggestions and points of view are important for effective two-way communications. Letters may be used in the following issue of CFE and will be edited prior to publication where necessary.

ECONOMIC ANALYSIS OF GRAIN AND OILSEED PRODUCTION IN WESTERN CANADA

L.M. Johnson *

Three-year rotations that included cereal grains were more profitable than two-year rotations in selected areas in the Prairie Provinces. Two-year rotations including rapeseed, however, produced higher returns than two- or three-year rotations of cereal grains only.

INTRODUCTION

The objectives of this article are to measure component expenditures, estimate yields and prices and compare income per cultivated acre of grains and oilseeds in Western Canada. Information is presented for five geographical areas. Comparison of income and expenses per cultivated acre can be made between areas as well as within areas.

The technique of farm budgeting is used to organize the information, making it possible to explicitly state the relationships of production, price and expense data to farm income. A budget differs from farm records since the latter presents a historical summary while the former can be used to estimate the impact of expenses, yields, prices and cultural practices on income.

Emphasis will be placed on the relative, rather than absolute, returns to land and management. The budgets represent typical farming practices for the principal grain and oilseed crops produced in each area.

DESCRIPTION OF AREAS

The Swift Current, Melfort-Tisdale, Estevan-Melita, North Battleford-Vegreville and Vulcan areas in the grain-producing region of the Prairies were chosen for this study. Representative farms were set up with specific crop acreages, reflecting average size census farms. This information is presented in Table 1, while locations are shown in Figure 1.

TABLE 1. SIZE OF FARMS AND LOCATION OF AREAS BY CENSUS DIVISION AND PROVINCE

Place Names	Census Division and Province	Total Acres	Improved Acres
		— number —	
Swift Current	8 (Saskatchewan)	1,280	1,140
Vulcan	5 (Alberta)	1,120	800
Estevan-Melita	4 and 8 (Manitoba) 1 (Saskatchewan)	800	600
Battleford-Vegreville	17 (Saskatchewan) 10 (Alberta)	700	460
Melfort-Tisdale	14 and 15 (Saskatchewan)	640	500

Source: Census of Canada, Agriculture 1971 with acreages rounded.

*L.M. Johnson is an economist with the Economics Branch, Agriculture Canada, in the Prairie Regional Office, Regina. Mr. Johnson has worked on a wide variety of studies relating to the economics of agricultural production in Western Canada during the past 18 years.

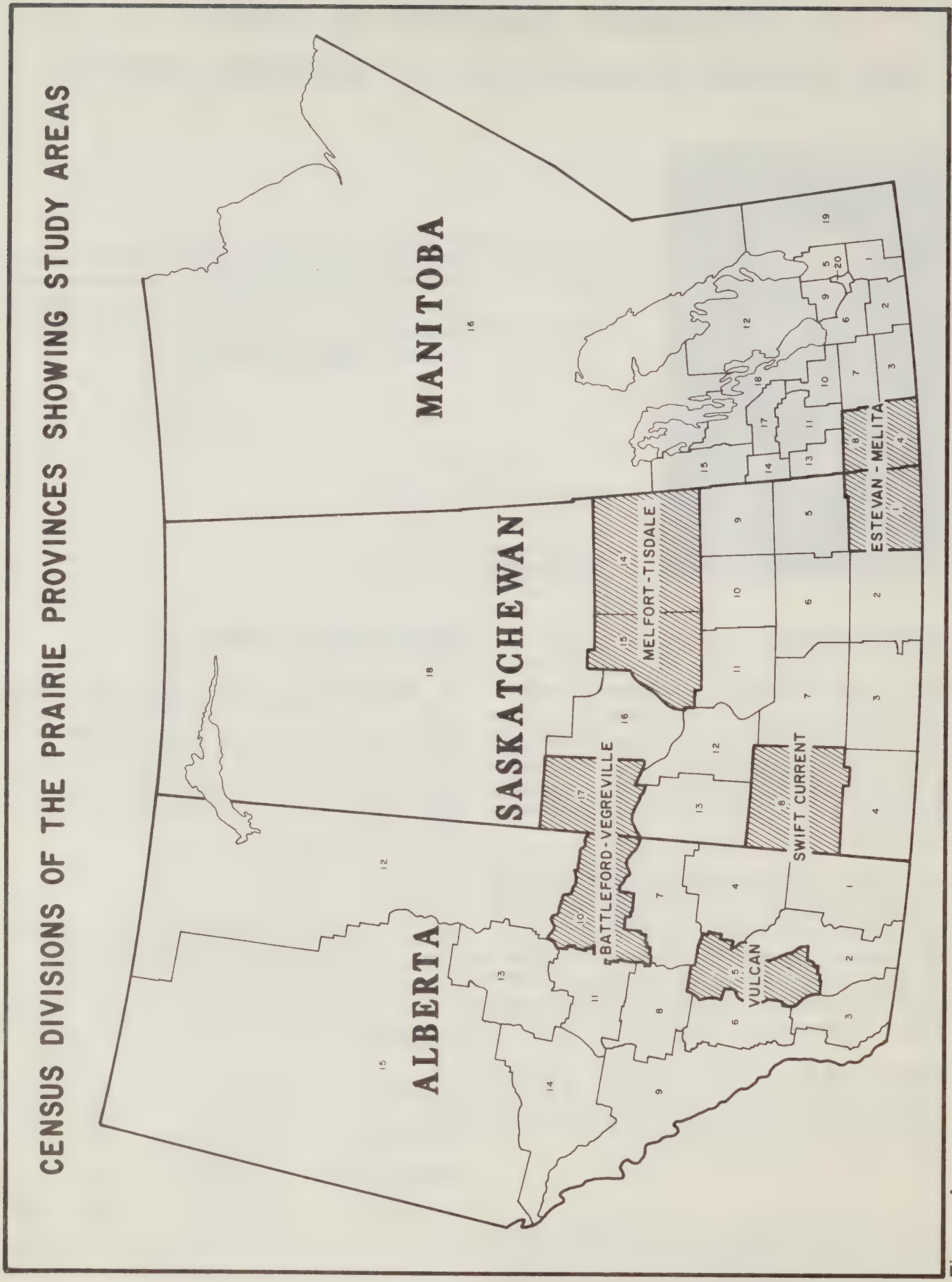
CENSUS DIVISIONS OF THE PRAIRIE PROVINCES SHOWING STUDY AREAS
ALBERTA
SASKATCHEWAN
MANITOBA
BATTLEFORD-VEGREVILLE
MELFORT-TISDALE
SWIFT CURRENT
VULCAN
ESTEVAN-MELITA

Figure 1

The Estevan-Melita area lies in the Dark Brown Soil Zone of south-eastern Saskatchewan and the Black Soil Zone of southwestern Manitoba. Soils are medium-textured loam to clay loam (1), and light-textured fine sandy loams (2). The average farm size was 800 acres with 600 acres improved.

The Melfort-Tisdale area's deep black soils accompanied by grayish-black and gray soils (1) are indicative of the Black Soil Zone of northeastern Saskatchewan. The medium soil textures are chiefly silty clay, silty clay-loam and loam. Topography is undulating with some smooth and rolling phases. Favorable moisture conditions and high soil organic matter and nitrogen make it one of the most productive areas in the province. The average farm size was 640 acres with 500 acres improved.

The Swift Current area is located in the Brown Soil Zone of southwestern Saskatchewan. It is arid since average annual precipitation is about 13 or 14 inches (3). It is characterized by short-grass prairie vegetation, absence of trees and frequent susceptibility to drought. The soils are mainly light-textured, ranging from fine sandy loams to light loams (1). Topography is undulating with some gently to moderately rolling phases. Average farm size was 1,280 acres with 1,140 acres improved.

The North Battleford-Vegreville area is situated in northwestern Saskatchewan and northeastern Alberta. This area is in the Black Soil Zone of the Parkland Region where soils are mostly loams with some fine sandy loams. Although variations exist, the soils are very productive because of high organic matter and nitrogen content, favorable topography and high soil moisture efficiency (1,4). Average farm size was 700 acres with 460 acres improved.

The Vulcan area is in the Dark Brown Soil Zone of south-central Alberta. Soils are medium-textured loams with some fine sandy loams and silty clay loams (5). The topography is mainly level to undulating with gently rolling phases. Average farm size was 1,120 acres with 850 acres improved.

PROCEDURE USED IN THE ANALYSIS

Data were collected from sources that included producers, machinery dealers, fertilizer and chemical companies, crop insurance agents and seed companies. Published and unpublished bulletins and manuscripts of physical inputs were also used. Cost components reflect those for producing grains and oilseeds in 1974.

Type and Size of Machinery

The machinery complement developed reflects a blend of the typical tillage practices of each area. The types and sizes of machines used in these budgets are shown in Table 2 and are assumed to be capable of performing the tillage, planting and harvesting operations for the farm sizes shown in Table 1.

Machinery Data

The machinery input information was synthesized from various published and unpublished sources (6). Implement dealers provided machinery price data from which depreciation and investment charges were calculated. The straight line method of depreciation was used and calculated on the assumption of ownership of a complete line of new 1974 model equipment. Depreciation rates varied, depending on the life expectancy of the machine. Machinery investment interest was charged at the rate of eight percent per annum on half the replacement cost plus salvage value and closely reflected the opportunity cost of capital invested in machinery.

Seeding Rates

Seeding rates were based on the rates common within each area. At Swift Current, wheat was seeded at the rate of one bushel an acre and barley at a bushel and a quarter. Rates in the other areas were a bushel and a quarter for wheat, two bushels for oats and a bushel and a half for barley. Flax was seeded at 32 pounds an acre and rapeseed at seven pounds an acre.

Fertilizers

Fertilizers are used on all crops in all areas except Swift Current where fewer farmers use them. Application rates are lower because of the light-textured soils and lower rainfall, which reduces the effectiveness of fertilizers. Seventy-five percent of the Swift Current area acreage is fertilized. The application rates in this analysis are similar to those recommended by the Saskatchewan Advisory Fertilizer Council.

Crop Insurance

Crop insurance costs are assumed for all crops at current rates charged in the respective provinces. Rates vary depending on expected yields, product prices, coverage option and the province. Diseases, insects, drought, hail, high winds and other natural hazards are covered.

TABLE 2. MACHINERY COMPLEMENT AND SIZE BY AREA, 1974

Kind of Machine	Unit	Swift Current	Melfort-Tisdale	Estevan-Melita	Battleford-Vegreville	Vulcan
Tractor (diesel)	H.P.	110	90	90	85	100
Tractor (gas)	H.P.	60	50	50	50	50
Light Cultivator	Ft.	32	—	—	—	28
Heavy Cultivator	Ft.	24	18	18	18	20
Harrow Attachment[1]	Ft.	—	18	18	18	20
Rodweeder Attachment[2]	Ft.	—	—	—	—	20
Rodweeder	Ft.	28	24	24	24	24
Drag Harrow	Ft.	42	36	42	36	39
Discer	Ft.	18	14	16	16	16
Seeder[3]	Ft.	18	14	16	16	16
Press Drill[4]	Ft.	—	14	16	14	16
Sprayer	Ft.	51	43	43	43	43
Swather[5]	Ft.	—	—	—	—	16
Swather[6]	Ft.	18	14	16	14	—
Combine[7]	In.[8]	40	37	39	37	40
Truck	Ton	2.5	2	2	2	2.5

[1] Harrow attachment for the heavy duty cultivator.
[2] Rodweeder attachment for the heavy duty cultivator.
[3] Seeder with fertilizer attachment for the discer.
[4] Press drill with fertilizer attachment.
[5] Self propelled swather.
[6] Power-take-off swather.
[7] Self-propelled combine.
[8] Cylinder size in inches.

Sources: (a) Unpublished oilseed studies in these areas by L.M. Johnson, Economics Branch, Regina.
(b) Unpublished hog production study by R.K. Eyvindson, Economics Branch, Ottawa.

Labor and Overhead

A land investment charge is not included in this analysis. It is difficult to estimate since some farmers had earlier purchased their land for a fraction of its current market value, some have paid current values and others rent their land. Also, land prices vary considerably because of soil, topography, climate and location. Building charges reflect costs of buildings to the grain enterprise including repairs, depreciation and interest on investment (1). Land taxes are estimates from previous studies (6). Other overhead expenses include small tools, hardware, hydro, telephone and farm share of the family car (1).

The farms are basically one-man units and a charge is shown for the operator's labor using average wages for male farm help on the Prairies in 1974 (8). The amount of crop production labor was estimated from Saskatchewan Department of Agriculture farm business summaries (1). Outlay for all of the above items has been indexed to 1974 price levels (7).

Prices, Yields and Value of Production

The per bushel farm prices, yields, grades and value of production for wheat, oats, barley, flax and rapeseed are presented in Table 3 (9).

Machine Time

Table 4 presents information on the number of machine operations performed each year to grow crops in these areas, as well as the time taken to prepare summerfallow and grow these crops in 1974 (6). Generally as the number of field operations to produce a crop increases, total time increases. This is not necessarily true in all cases because the type of machine used, as well as the size, can have a modifying impact. For example, in the Melfort-Tisdale area, 7.5 tillage operations for wheat on fallow were performed in .94 hours. In the Vulcan area, 8.0 operations took .86 hours. The extra time required to perform fewer operations in the Melfort-Tisdale area results from the use of smaller machines on smaller farms.

Machinery Costs

Expenses are expected to rise as the total machine time needed to produce a crop increases. This may not be true since the costs of operating different types and sizes of machines vary. The number of operations (times over) and the operating time (hours taken) formed the basis for determining the budgeted machinery expenses presented in the following tables. Machinery costs

TABLE 3. ESTIMATED AVERAGE GRADES, FARM PRICE[1] PER BUSHEL, YIELDS AND VALUE PER SEEDED ACRE FOR SMALL GRAIN AND OILSEED CROPS BY AREA, 1974

Area and Crop	Grade[2]	Price Per Bushel	Yield Per Acre		Value Per Acre[3]	
			Fallow	Stubble	Fallow	Stubble
		—dollars—	— bushels —		— dollars —	
Swift Current						
Wheat	2 C.W.	4.28	21	—	89.88	—
Barley	1 Feed	2.40	32	—	76.80	—
Melfort-Tisdale						
Wheat	3 C.W.	4.16	26	18	108.16	74.88
Barley	2 Feed	2.39	—	27	—	64.53
Rapeseed	1 Can.	7.20	19	—	136.80	—
Estevan-Melita						
Wheat	2 C.W.	4.31	24	—	103.44	—
Barley	1 Feed	2.43	—	25	—	60.75
Flax	1 C.W.	10.34	—	7.7	—	79.62
Battleford-Vegreville						
Wheat	3 C.W.	4.16	28	—	116.48	—
Barley	2 Feed	2.39	—	28	—	66.92
Oats	2 Feed	1.54	—	38	—	58.52
Rapeseed	1 Can.	7.20	19	—	136.80	—
Vulcan						
Wheat	1 C.W.	4.37	31	21	135.47	91.77
Barley	1 Feed	2.41	49	34	118.09	81.94

[1] Prices for wheat, oats, barley are 1973-74 C.W.B. prices basis Thunder Bay. Flax and rapeseed prices from Winnipeg Commodity Exchange, Jan.-Dec. 1974. All prices minus marketing charges.
[2] Numbers 1, 2 and 3 C.W. wheat is Canada Western Red Spring Wheat. Flax 1 C.W. is Number 1 Canada Western and Rapeseed 1 Can. is is Number 1 Canada. Grades lower for some crops because of adverse weather at harvest. 1974 Unpublished Data, Canadian Grain Commission, pers. comm.
[3] Equals yield per acre times price per bushel.

include depreciation and interest on investment (fixed costs) as well as repairs, fuel, oil, grease and other lubricants (operating costs). The tillage operations and machine sizes are typical of those in 1974.

ANALYSIS

Costs of Wheat on Fallow

Table 5 shows that combined crop service and machinery expenses for wheat on fallow ranged from $14.69 an acre in the Swift Current area to $17.64 in the Battleford-Vegreville and Vulcan areas. It also shows that costs of summerfallowing ranged from $2.58 an acre at Swift Current to $5.16 at Melfort-Tisdale. The low at Swift Current results from the use of larger machines and from fewer tillage operations to control weeds.

Costs of Wheat on Stubble

Combined crop and machinery expenses for wheat on stubble were almost identical in the Melfort-Tisdale and Vulcan areas at about $19 an acre (Table 6).

Cost of Barley on Fallow

Combined crop and machinery expenses for barley on fallow totalled $13.32 at Swift Current and $15.61 in the Vulcan area (Table 7). The difference is due mainly to seed and fertilizer costs.

Costs of Barley on Stubble

Table 8 indicates that combined crop and machinery expenses for barley on stubble were almost identical at about $17 an acre for the four areas shown. All component expenses were almost identical as well.

Costs of Oats and Flax on Stubble

Crop and machinery expenses for oats on stubble in the Battleford-Vegreville area were $16.08 a seeded acre while total expenses for flax on stubble in the Estevan-Melita area were $18.26 an acre (Table 9).

Costs of Rapeseed on Fallow

Combined expenses for rapeseed on fallow were $18.32 for the Melfort-Tisdale area and $17.19 for the

TABLE 4. NUMBER OF FIELD OPERATIONS AND HOURS TAKEN TO PREPARE SUMMERFALLOW AND PRODUCE SMALL GRAIN AND OILSEED CROPS ON FALLOW AND STUBBLE BY AREA, 1974

Area and Crop	Field Operations	Total Hours
	— number —	
Swift Current		
Summerfallow	4.3	.33
Wheat on Fallow	6.6	.72
Barley on Fallow	6.7	.72
Melfort-Tisdale		
Summerfallow	7.9	.78
Wheat on Fallow	7.5	.94
Wheat on Stubble	8.4	1.02
Barley on Stubble	8.5	1.03
Rapeseed on Fallow	8.0	1.00
Estevan-Melita		
Summerfallow	6.3	.69
Wheat on Fallow	7.6	.78
Barley on Stubble	7.9	.95
Flax on Stubble	8.1	.99
Battleford-Vegreville		
Summerfallow	6.4	.66
Wheat on Fallow	7.2	.90
Barley on Stubble	7.7	.90
Oats on Stubble	7.5	.92
Rapeseed on Fallow	6.6	.88
Vulcan		
Summerfallow	6.0	.54
Wheat on Fallow	8.0	.86
Wheat on Stubble	8.9	.95
Barley on Fallow	7.7	.76
Barley on Stubble	8.7	.93

Source: See sources, Table 2.

Battleford-Vegreville area, the difference being due to higher herbicide costs in the former (although crop insurance costs were higher in the latter) as shown in Table 10.

Costs of Labor, Buildings, Farm Overhead and Land Taxes

Labor costs were lowest at Swift Current at \$4.83 a cultivated acre, compared to \$5.29 an acre at Vulcan and \$5.49 an acre in the other three areas (Table 11). Costs were lowest at Swift Current since fewer trips were made over the field in that area.

Building costs were lowest in the Swift Current area at \$1.06 a cultivated acre. There, grain yields are lower and only half the land is cropped each year. This reduces the required storage capacity and cost. In the other areas building costs were about \$1.25 a cultivated acre.

Overhead costs were about the same for all areas ranging from \$1.32 at Swift Current to \$1.41 a cultivated acre in the Vulcan area.

Land taxes ranged from \$1.30 an acre at Vulcan to \$1.82 in the Melfort-Tisdale area.

CROP ROTATION EXPENDITURES AND VALUES

Crop rotation expenditures and crop values are shown according to area in Table 12. Expenses and income for crop rotations in 1974 have been calculated from the preceding tables. Also shown are average receipts and average annual net values of these rotations during the 10-year period 1964-73. These receipts have been calculated by using average prices and yields for this period. Average annual net values for these years are the average receipts minus the 1974 rotation expenses. Relative annual net values of the rotations in 1974 can be compared with the average returns in the previous 10 years using 1974 expenses.

The following process was used to calculate the 1974 rotation expenses. Assume a farmer at Swift Current has a two-year rotation of fallow-wheat. In Table 5 the expenses for crop services, machinery and summerfallow are shown as \$8.43, \$6.26 and \$2.58 a cultivated acre. Since this is a two-year rotation, two years of labor costs, building charges, farm overhead and land taxes amount to \$9.66, \$2.12, \$2.64 and \$2.70 a cultivated acre in that order (Table 11). Therefore, the total expenses for this fallow-wheat rotation will be \$34.39 a cultivated acre (an average annual outlay of \$17.20 a cultivated acre). Table 3 shows that 1974 wheat crop receipts were \$89.88 or \$44.94 a cultivated acre per year for this two-year rotation. Therefore, the average annual net value will be \$44.94 – \$17.20 = \$27.74 a cultivated acre. This is the return to land investment and management. Using this method, the per cultivated acre returns for each crop rotation may be calculated and comparisons made both within and between areas.

The annual net 1974 rotation values were much higher than the previous 10-year average. Although yields in general were two to three bushels lower for most crops in 1974, higher prices for all crops increased all rotation values in all areas. For example, the 1974 per bushel price of wheat was 2.4 times greater than the previous 10-year average, oats 2.2, barley 2.3, rapeseed 2.7 and flax 3.0 times greater.

Despite lower yields and higher prices in 1974, the relative annual net values of the various rotations, in most cases, closely approximated the previous 10-year

TABLE 5. CROP SERVICE AND MACHINERY EXPENSES FOR WHEAT ON FALLOW AND COST OF PREPARING SUMMERFALLOW BY AREA, WESTERN CANADA, 1974

Item	Wheat on Fallow				
	Swift Current	Melfort-Tisdale	Estevan-Melita	Battleford-Vegreville	Vulcan
	— dollars per crop acre —				
Crop Service Expenses					
Seed	4.70	5.89	5.91	5.88	5.89
Weed Spray	.20	.31	.27	.34	.31
Fertilizer	2.04	2.72	2.72	2.72	2.72
Crop Insurance	1.37	1.46	.92	1.57	1.47
Seed Cleaning	.12	.15	.15	.15	.15
Sub-Total	8.43	10.53	9.97	10.61	10.54
Machinery Expenses					
Before Seeding	.51	1.14	1.03	1.10	1.59
Seeding	1.08	1.21	1.15	1.21	1.15
After Seeding	.48	.40	.26	.25	.28
Harvest	4.19	4.26	4.18	4.47	4.08
Sub-Total	6.26	7.01	6.62	7.03	7.10
Crop Service and Machinery Expenses	14.69	17.54	16.59	17.64	17.64
Summerfallow[1]	2.58	5.16	4.80	4.59	3.78

[1] Machinery expenses of preparing summerfallow.

Sources: (a) Unpublished data from oilseed and hog production studies by L.M. Johnson and R.K. Eyvindson, respectively, Economics Branch, Agriculture Canada.

(b) Producers, machinery dealers, fertilizer, chemical and seed companies and provincial crop insurance corporations.

TABLE 6. CROP SERVICE AND MACHINERY EXPENSES FOR WHEAT ON STUBBLE BY AREA, WESTERN CANADA, 1974

Item	Wheat on Stubble	
	Melfort-Tisdale	Vulcan
	— dollars per crop acre —	
Crop Service Expenses		
Seed	5.89	5.89
Weed Spray	.34	.31
Fertilizer	4.48	4.48
Crop Insurance	.76	.87
Seed Cleaning	.15	.15
Sub-Total	11.62	11.70
Machinery Expenses		
Previous Fall	.68	.98
Before Seeding	.84	1.02
Seeding	1.23	1.13
After Seeding	.39	.28
Harvest	4.24	4.06
Sub-Total	7.38	7.47
Crop Service and Machinery Expenses	19.00	19.17

Source: See sources, Table 5.

TABLE 7. CROP SERVICE AND MACHINERY EXPENSES FOR BARLEY ON FALLOW BY AREA, WESTERN CANADA, 1974

Item	Barley on Fallow	
	Swift Current	Vulcan
	— dollars per crop acre —	
Crop Service Expenses		
Seed	2.96	3.57
Weed Spray	.22	.30
Fertilizer	2.04	2.72
Crop Insurance	1.67	1.68
Seed Cleaning	.15	.18
Sub-Total	7.04	8.45
Machinery Expenses		
Before Seeding	.50	1.62
Seeding	1.08	1.21
After Seeding	.48	.20
Harvest	4.22	4.13
Sub-Total	6.28	7.16
Crop Service and Machinery Expenses	13.32	15.61

Source: See sources, Table 5.

TABLE 8. CROP SERVICE AND MACHINERY EXPENSES FOR BARLEY ON STUBBLE BY AREA, WESTERN CANADA, 1974

Item	Barley on Stubble			
	Melfort-Tisdale	Estevan-Melita	Battleford-Vegreville	Vulcan
	— dollars per crop acre —			
Crop Service Expenses				
Seed	3.57	3.60	3.56	3.57
Weed Spray	.37	.25	.37	.30
Fertilizer	4.48	4.48	4.48	4.48
Crop Insurance	.73	.98	1.24	1.17
Seed Cleaning	.18	.18	.18	.18
Sub-Total	9.33	9.49	9.83	9.70
Machinery Expenses				
Previous Fall	.75	.79	.39	.92
Before Seeding	.84	.95	.97	1.04
Seeding	1.23	1.09	1.11	1.13
After Seeding	.39	.20	.30	.24
Harvest	4.28	4.20	4.49	4.10
Sub-Total	7.49	7.23	7.26	7.43
Crop Service and Machinery Expenses	16.82	16.72	17.09	17.13

Source: See sources, Table 5.

TABLE 9. CROP SERVICE AND MACHINERY EXPENSES FOR OATS AND FLAX ON STUBBLE BY AREA, WESTERN CANADA, 1974

Item	Oats on Stubble	Flax on Stubble
	Battleford-Vegreville	Estevan-Melita
	— dollars per crop acre —	
Crop Service Expenses		
Seed	2.64	6.04
Weed Spray	.50	.92
Fertilizer	4.48	2.52
Crop Insurance	1.15	1.05
Seed Cleaning	.24	.20
Sub-Total	9.01	10.73
Machinery Expenses		
Previous Fall	.48	.79
Before Seeding	.66	1.26
Seeding	1.11	1.15
After Seeding	.30	.19
Harvest	4.52	4.14
Sub-Total	7.07	7.53
Crop Service and Machinery Expenses	16.08	18.26

Source: See sources, Table 5.

TABLE 10. CROP SERVICE AND MACHINERY EXPENSES FOR RAPESEED ON FALLOW BY AREA, WESTERN CANADA, 1974

Item	Rapeseed on Fallow	
	Melfort-Tisdale	Battleford-Vegreville
	— dollars per crop acre —	
Crop Service Expenses		
Seed	1.75	1.75
Seed Treatment	.89	.89
Weed Spray	4.16	2.77
Fertilizer	2.72	2.72
Crop Insurance	1.56	2.07
Sub-Total	11.08	10.20
Machinery Expenses		
Before Seeding	1.50	1.14
Seeding	1.21	1.21
After Seeding	.29	.19
Harvest	.24	4.45
Sub-Total	7.24	6.99
Crop Service and Machinery Expenses	18.32	17.19

Source: See sources, Table 5.

average. For instance, in the Melfort-Tisdale area in 1974 the annual net values of a fallow-wheat rotation, a fallow-wheat-wheat and fallow-wheat-barley rotation were $32.81, $37.19 and $34.70 a cultivated acre. The previous 10-year average values for these rotations were $4.07, $5.14 and $4.76 a cultivated acre. In both cases the value of the fallow-wheat-wheat rotation was higher than the others. This relation was fairly consistent for the rotations in all areas with a few exceptions. For

TABLE 11. ANNUAL LABOR AND BUILDING COSTS, FARM OVERHEAD AND LAND TAX CHARGES BY AREA, WESTERN CANADA, 1974

Area	Labor	Buildings	Farm Overhead[1]	Land Taxes
	— dollars per cultivated acre —			
Swift Current	4.83	1.06	1.32	1.35
Melfort-Tisdale	5.49	1.25	1.36	1.82
Estevan-Melita	5.49	1.25	1.36	1.36
Battleford-Vegreville	5.49	1.25	1.36	1.57
Vulcan	5.29	1.23	1.41	1.30

[1] Includes small hardware, tools and farm share of hydro, telephone and family car.

Source: The outlay for labor, buildings and farm overhead are taken from Saskatchewan Farm Business Summaries. Land taxes are from unpublished oilseed and hog production studies in these areas.

TABLE 12. CROP ROTATION EXPENDITURES AND VALUE OF CROP PRODUCTION BY AREA, WESTERN CANADA IN 1974 AND 1964 TO 1973

Area and Crop Rotation	Rotation Expense[1]	Rotation Receipts		Annual Net Value[2]	
		1974	10-year[3]	1974	10-years[3]
		— dollars per cultivated acre —			
Swift Current					
Fallow-Wheat	17.20	44.94	18.10	27.74	.90
Fallow-Barley	16.51	38.40	17.49	21.89	.98
Melfort-Tisdale					
Fallow-Wheat	21.27	54.08	25.34	32.81	4.07
Fallow-Wheat-Wheat	23.82	61.01	28.96	37.19	5.14
Fallow-Wheat-Barley	23.09	57.56	27.85	34.70	4.76
Fallow-Rapeseed	21.66	68.40	29.70	46.74	8.04
Fallow-Rapeseed-Wheat	24.08	70.56	31.87	46.48	7.79
Fallow-Rapeseed-Barley	23.35	67.11	30.75	43.76	7.40
Estevan-Melita					
Fallow-Wheat	20.16	51.72	22.62	31.56	2.46
Fallow-Wheat-Barley	22.16	54.73	25.68	32.57	3.52
Fallow-Wheat-Flax	22.68	61.02	26.09	38.34	3.41
Battleford-Vegreville					
Fallow-Wheat	20.78	58.24	24.43	37.46	3.65
Fallow-Wheat Barley	22.78	61.13	26.54	38.35	3.76
Fallow-Wheat-Oats	22.44	58.33	25.62	35.89	3.18
Fallow-Rapeseed	20.56	68.40	27.00	47.84	6.44
Fallow-Rapeseed-Barley	22.63	67.91	28.25	45.28	5.62
Fallow-Rapeseed-Oats	22.29	65.11	27.33	42.42	4.64
Vulcan					
Fallow-Wheat	19.94	67.73	29.86	47.79	9.92
Fallow-Wheat-Wheat	22.76	75.75	39.82	52.99	17.06
Fallow-Wheat-Barley	22.08	72.47	32.63	50.39	10.55
Fallow-Barley	18.92	59.04	27.56	40.12	8.64
Fallow-Barley-Wheat	22.08	69.95	31.65	47.87	9.57
Fallow-Barley-Barley	21.40	66.68	31.09	45.28	9.69

[1] Expenses in 1974.
[2] Annual return to land and management.
[3] Average receipts and net value for the period 1964-73.

Source: Calculated from Table 3 and Tables 5 to 11 inclusive.

example, the 1974 annual net value of a fallow-wheat-flax rotation was $38.34 a cultivated acre, considerably higher than the $32.57 for fallow-wheat-barley. For the previous 10-year average, however, a fallow-wheat-barley rotation was somewhat higher at $3.52 a cultivated acre compared with $3.41 an acre for fallow-wheat-flax.

When computing individual crop values in a rotation, adjustments to yield levels may be made from those used in this analysis. These values may be recalculated by multiplying the new yield by price. Similarly, calculation may also be made using prices differing from those used in this study. By adjusting yields and prices to fit a particular farm situation, a new net value may be computed to compare relative returns from different rotations.

At Swift Current, usually half the cultivated acreage is summerfallowed and the other half is cropped. Lighter soils and lower rainfall in this area compared to other areas are responsible for consideration of a two-year rotation. Rotation expenditures in 1974 for fallow-wheat were $17.20 a cultivated acre compared with $16.51 an acre for fallow-barley. The annual net value of $27.74 a cultivated acre for fallow-wheat was about $6 an acre higher than the fallow-barley rotation value of $21.89 an acre. This is an expected return to land investment and management.

In the Melfort-Tisdale area, a two-year rotation of both fallow-wheat and fallow-rapeseed was considered. Since some of the land was stubble cropped, several combinations of wheat, barley and rapeseed were used in a

three-year rotation. A two-year rotation of fallow-rapeseed was the most profitable in 1974 yielding an annual net value of $46.74 a cultivated acre. The next most profitable was a three-year rotation of fallow-rapeseed-wheat valued at $46.48 a cultivated acre. The value for a two-year rotation of fallow-wheat was $32.81, considerably less profitable than the fallow-rapeseed combination. For the previous 10-year period, fallow-rapeseed returns were $8.04 a cultivated acre, nearly twice those of fallow-wheat at $4.07 an acre. This emphasizes the importance of including rapeseed in rotations within this area.

Within the Estevan-Melita area, a three-year fallow-wheat-flax rotation ending in 1974 produced a yearly net value of $38.34 an acre compared with $31.56 for a two-year rotation of fallow-wheat. The fallow-wheat-flax combination also showed better returns than a fallow-wheat rotation for the previous 10-year period but was slightly lower than a fallow-wheat-barley rotation for that same period.

The 1974 yearly net value of rotations in the Battleford-Vegreville area ranged from $35.89 an acre for a three-year rotation of fallow-wheat-oats to $47.84 a cultivated acre of fallow-rapeseed. All rotations in this area that included rapeseed yielded considerably higher returns than those with only cereal grains both in 1974 and over the 1964-73 period. In 1974 expenses for all three-year rotations were between $22 and $23 a cultivated acre, about $2 higher than expenses for the two-year rotations.

A three-year rotation of fallow-wheat-wheat was the most profitable in the Vulcan area in both 1974 and the previous 10-year period with values of $52.99 and $17.06 a cultivated acre. The lowest return was $40.12 a cultivated acre for a two-year rotation of fallow-barley. A fallow-wheat rotation with a yearly net value of $47.79 an acre was comparable to three-year rotations of fallow-barley-wheat at $47.87 an acre and fallow-barley-barley at $45.28 an acre.

Generally, a two-year rotation including only cereal crops was less profitable than a three-year rotation. This was not true in all cases and depended on the crops produced; for instance, in the Battleford-Vegreville area, the 1974 annual net value for a fallow-wheat rotation was $37.46 a cultivated acre compared with $35.89 for a rotation of fallow-wheat-oats. The average annual expenses were higher for all three-year rotations mainly because of extra crop service expenses for producing the additional crop.

In both the Melfort-Tisdale and Battleford-Vegreville areas a two-year rotation of fallow-rapeseed yielded a higher annual net value than a three-year rotation of fallow-rapeseed followed by a cereal crop. This was the case in 1974 and also during the previous 10-year period. The annual net value in the Battleford-Vegreville area for a fallow-rapeseed rotation in 1974 was $47.84 a cultivated acre compared with $42.42 for a rotation of fallow-rapeseed-oats. The respective values for the previous 10-year period were $6.44 and $4.64 a cultivated acre. Rotations that included rapeseed yielded considerably higher returns than those that included only cereal grains both in 1974 and the previous 10-year period.

SUMMARY AND CONCLUSIONS

Although crop yields were lower and prices higher in 1974, the relative annual values of the various rotations followed the same pattern as the average for the 1964-73 period.

Two-year rotations including only cereal grains were generally less profitable than three-year rotations. Therefore, provided weeds can be controlled and moisture conditions are favorable, farmers should lengthen rotations that include only cereals. Increased use of commercial fertilizer and herbicides could results.

Yearly net rotation values in 1974 ranged from $21.89 a cultivated acre for fallow-barley at Swift Current to $52.89 a cultivated acre for a fallow-wheat-wheat rotation at Vulcan.

In both the Melfort-Tisdale and Battleford-Vegreville areas, two-year rotations of fallow-rapeseed yielded a greater annual net value than three-year rotations of fallow-rapeseed followed by a cereal grain. This was the case in 1974 and for the previous 10-year average.

Rotations in 1974 and over the 1964-73 period that included rapeseed yielded considerably higher returns than those that included only cereal grains. Therefore in areas where rapeseed can be successfully grown, it should be included in the rotation to maximize returns.

Machinery expenses for preparing summerfallow ranged from $2.58 an acre at Swift Current to $5.16 an acre at Melfort-Tisdale.

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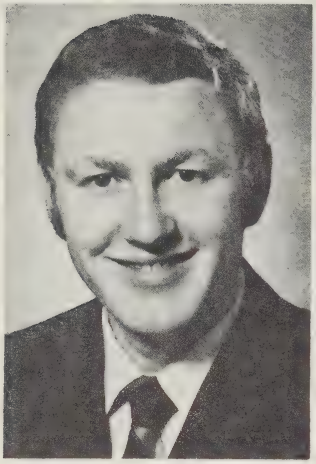
CHARACTERISTICS OF IRRIGATED FARMS IN SOUTHERN ALBERTA



Some results of a survey of irrigation farms in southern Alberta are presented. Much of the irrigated agriculture is closely integrated with grain and beef enterprises on dryland. Cereals and forages are the dominant crops on irrigated land. Specialty crops (sugar beets, potatoes, processing vegetables) are grown under contract on a small proportion of the irrigated acreage.

*K.D. Russell and B.H. Sonntag**

INTRODUCTION

In 1970, 3,678 farms paid for "water rights" on more than 760,000 acres of land in southern Alberta. The acreage for which a farmer has "water rights" is called irrigable land. The farmer pays for water use on this acreage whether he irrigates it or not. Census data indicate that 537,321 acres or 71 percent of the total reported irrigable acres were actually irrigated in 1970.

This article reports the results of a survey of irrigated farms in southern Alberta, undertaken jointly by the Marketing Division, Alberta Agriculture and the Economics Branch, Agriculture Canada. The survey was based on a random 10-percent sample of water users (those who pay for water rights) in the 10 largest irrigation districts. The smaller irrigation districts were not surveyed. Replacements were made if a farmer reported less than 20 acres of irrigable land or the land was not used for agricultural production in 1973. The results are based on 1973 data.

The survey was designed to obtain the following information:

- General structure and organization of the farm business
- Land resources available to the farm and the current pattern of use
- Management practices used for individual crops (fertilizer program, irrigation program, etc.)
- Livestock numbers and production systems
- Custom work hired and performed
- Irrigation system inventories
- Inventories of special structures and machines
- Labor situation (operator, hired or off-farm).[1]

ORGANIZATION OF IRRIGATED AREAS

The irrigation community in southern Alberta currently comprises 13 irrigation districts (Figure 1). At the time of the survey there were 14 districts; however, the federal Bow River Irrigation District (BRID) and the provincial Bow River Irrigation District have since amalgamated. St. Mary's River Irrigation District (SMRID) is separated into two distinct areas by the

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[1] Information on survey results not reported in this article can be obtained from the authors.

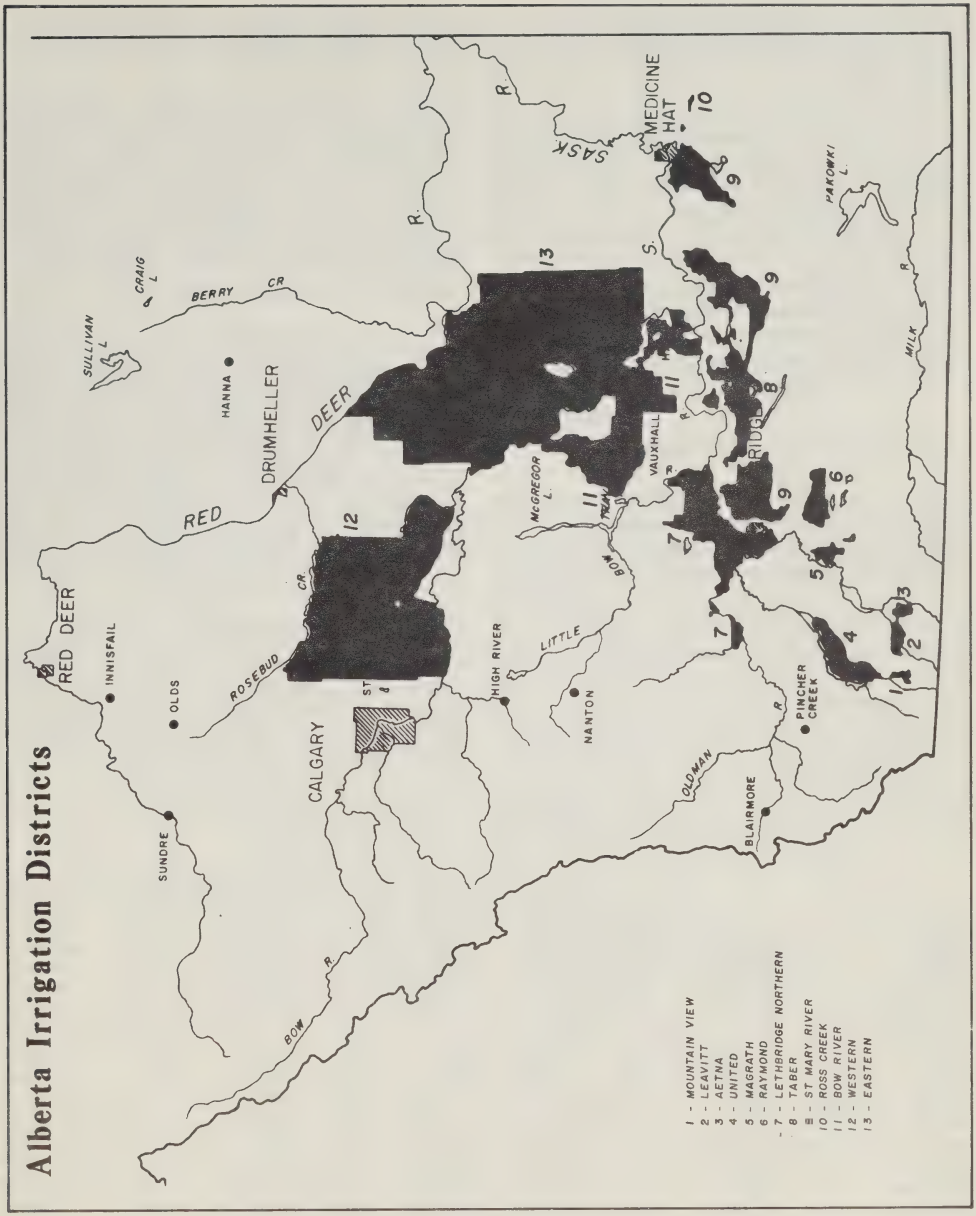
Alberta Irrigation Districts
RED DEER
INNISFAIL
OLDS
SUNDRE
CALGARY
HIGH RIVER
NANTON
PINCHER CREEK
BLAIRMORE
HANNA
DRUMHELLER
RED
DEER
ROSEBUD
CR.
SULLIVAN L
CRAIG L
BERRY CR
McGREGOR L.
LITTLE
BOW
R.
VAUXHALL
RIDGE
MEDICINE HAT
SASK
S.
PAKOWKI L.
MILK
OLDMAN
BOW
1 - MOUNTAIN VIEW
2 - LEAVITT
3 - AETNA
4 - UNITED
5 - MAGRATH
6 - RAYMOND
7 - LETHBRIDGE NORTHERN
8 - TABER
9 - ST MARY RIVER
10 - ROSS CREEK
11 - BOW RIVER
12 - WESTERN
13 - EASTERN

Figure 1

Taber Irrigation District (TID) and in the survey it was treated as two separate districts. SMRID (eastern) and SMRID (western).

The irrigation districts encompass a range of agro-climatic conditions. There are arid areas that are very dependent on irrigation and others that use only supplemental irrigation on forage crops. This is reflected in a wide divergence in structure and organization of farms in different irrigation districts. Soil and topography also vary widely. As a result, the irrigated acreage is concentrated within a small area in some districts (Taber Irrigation District) while in others it is widely dispersed (Eastern Irrigation District (EID) and Western Irrigation District (WID)).[2]

LABOR ON IRRIGATED FARMS

Irrigated crop production tends to be much more labor intensive than dryland crop production mainly because different crops are grown on irrigated land. Extra cultural practices and tillage are needed for weed, insect, and disease control. In addition, high investment costs of specialized machines have resulted in continued use of labor-intensive techniques for certain crops, especially on small farms. Extra labor, of course, is needed to apply the irrigation water.

The labor situation on irrigated farms was an important component of the survey (Table 1). The number of farmers interviewed reflects the number of irrigation farms in the respective districts (10 percent of the "water users"). A total of 475 farmers were interviewed, ranging from 13 in the BRID (provincial) to 156 in the SMRID. The average age of farm operators varied little among districts.

Irrigation farms vary widely in size and intensity of irrigated crop production. Some farms reported hiring significant seasonal or casual labor while others reported considerable off-farm work. The Raymond Irrigation District (RID) illustrates this variation. Forty-four percent of the farms surveyed in the RID had more than one full-time operator and an average of 3.9 full-time men per farm. Many of these same farms also hired additional seasonal labor. Half of the farms in the RID, on the other hand, reported substantial off-farm work (averaging 105 days per year or roughly half-time).

The proportion of all irrigation farms reporting off-farm work (17%) and the amount of off-farm work performed (average of 140 days) suggests that many irrigation farms are part-time farms, a situation not unlike that found in most farming areas. The proximity to urban labor markets appears to affect the incidence and extent of

[2]See Birchfield, G.A. and K.D. Russell, *Canadian Farm Economics,* Vol. 10, No. 3, June 1975.

TABLE 1. LABOR SITUATION ON SURVEYED FARMS – PER FARM REPORTING

Irrigation District	No. Farms Interviewed	Ave. Age of Principal Operator	Ave. No. days Casual Hired Help	Percentage of Farms Reporting Casual Help	Ave. No. Days Work Off Farm	Percentage of Farms Reporting Off Farm Work[1]	Percentage of Reporting More Than 1 Full Time Man	Ave. No. of Operators on Multi-man Farms[2]
St. Mary's River (western)	74	45	437	47	148	24	23	3.0
St. Mary's River (eastern)	82	45	252	39	126	11	21	2.4
Taber	41	43	511	51	106	20	29	2.7
Bow River Development (federal)	28	43	106	64	60	11	29	2.4
Bow River Development (provincial)	13	54	43	62	56	23	15	2.0
Lethbridge Northern	65	45	154	34	172	17	14	2.6
Raymond	18	41	124	61	105	50	44	3.9
Eastern	96	43	96	36	75	16	22	2.7
Western	44	44	155	43	138	5	30	2.2
United	14	46	172	21	160	29	21	2.0
All Districts	475	45	235	43	140	17	23	2.6

[1]Does not include custom work.
[2]Operators include full-time hired men, active company and partnership members.

off-farm work. With the exception of the United Irrigation District (UID), all districts reporting a high average number of days of off-farm work are located near large urban centres such as Lethbridge, Medicine Hat, and Calgary. In most districts, the number of farms hiring casual help was substantially larger than the number of farms reporting off-farm work. A large share of the seasonal labor was employed on farms producing intensive crops such as sugar beets, potatoes, and processing vegetables. Ninety-seven percent of the farms that reported full-time hired labor reported some livestock, and 88 percent reported a cattle feeding enterprise.

Total labor available on surveyed farms was compared with typical time requirements reported in farm management manuals and other reports for specific enterprises. The average time available was twice that calculated on the basis of the published figures for the enterprises involved. This discrepancy can be attributed to bottleneck time periods that prevent full use of labor, and under-estimation, in the manuals, of time requirements for labor supervision, surveillance for diseases and insects, and other management tasks.

LAND USE AND CROP PRODUCTION ON IRRIGATED FARMS

The distribution of land among uncultivated, cultivated and irrigated areas on surveyed farms is a further indication of the wide diversity of types of irrigated agriculture (Table 2). The uncultivated land is used mainly for cattle grazing while cultivated dryland is used mainly for cereal grains.

Five of the ten irrigation districts surveyed irrigated an average of more than 50 percent of the cultivated land. This indicates that irrigation is a major component of the farm businesses. The average irrigable acreage for the 10 districts was 50 percent of the average cultivated acreage. Average irrigable acreage varied from 66 to 72 percent of the cultivated acreage in five irrigation districts (SMRID (western), TID, EID, Lethbridge Northern Irrigation District (LNID), BRID) to 13 percent in the WID.

Average farm size varied from 1,385 acres in the WID to 443 acres in the LNID. Average cultivated acreage ranged from 1,200 acres in the WID, where irrigation is used mainly for forage production, to 380 acres in the LNID. Average irrigable land varied from 478 acres in the BRID (federal) to 152 acres in the WID.

Forages and cereals are the dominant crops in all irrigation districts (Tables 3 & 4). Farmers in the UID and WID irrigated only hay and pasture. These farms are mainly dryland cattle and grain operations located in areas that usually receive adequate rainfall for cereal and oilseed crops.

Sugar beets and potatoes are the main specialty crops grown on irrigable land in southern Alberta. Sugar beets are produced mainly in the irrigated area running west-east through Lethbridge, Taber, and Bow Island. Potatoes and processing vegetables are grown mainly in a south-north pattern from Taber to Vauxhall. Sugar beets and potatoes were produced on farms in six of the ten districts. Sugar beet acreage varied by irrigation district,

TABLE 2. LAND USE ON SURVEYED FARMS

Irrigation District	Total Acres	Average Cultivated Acreage	Percentage of Cultivated Land Irrigated	Average Irrigable Acreage	Percentage of Irrigable Land Irrigated
St. Mary's River (western)	462	425	60	281	90
St. Mary's River (eastern)	878	621	46	305	93
Taber	999	531	50	369	72
Bow River Development (federal)	672	665	63	478	87
Bow River Development (provincial)	1,256	1,033	13	234	59
Lethbridge Northern	443	380	58	265	84
Raymond	1,180	1,078	25	475	56
Eastern	1,169	403	61	279	89
Western	1,385	1,201	7	152	55
United	811	707	22	183	85
All Districts	878	593	41	293	83

TABLE 3. IRRIGATED CROPS GROWN ON SURVEYED FARMS[1]

Irrigation District	Hay & Silage	%	Pasture	%	Cereals	%	Sugar Beets	%	Potatoes	%	Mustard & Oil Seeds	%	Vegetables	%	Grain Corn	%	Summer-fallow[2]	%
									— acres —									
St. Mary's River (western)	76	86	39	54	165	74	92	20	125	1	43	5	0	0	0	0	66	38
St. Mary's River (eastern)	72	70	69	43	174	79	75	37	146	5	61	13	67	10	130	2	44	20
Taber	66	80	64	54	120	91	75	63	160	7	30	2	0	0	40	2	84	46
Bow River Development (federal)	112	86	125	25	211	93	102	21	750	4	40	7	86	39	275	4	78	50
Bow River Development (provincial)	53	85	45	31	86	54	0	0	0	0	62	23	5	8	0	0	68	46
Lethbridge Northern	82	88	55	63	130	74	70	26	130	2	30	2	0	0	0	0	97	35
Raymond	105	94	95	50	89	72	157	22	0	0	45	6	0	0	0	0	64	17
Eastern	144	88	135	28	115	64	0	0	82	3	52	5	45	3	0	0	75	26
Western	74	59	105	14	20	2	0	0	0	0	0	0	0	0	0	0	0	0
United	134	57	81	57	4	7	0	0	0	0	0	0	0	0	0	0	0	0
All Districts	95	79	73	42	144	66	82	21	178	3	53	6	71	5	144	1	74	28

[1] In all cases acreages and percentages refer to farms reporting.
[2] Refers to summerfallow on irrigated land only.

Cereals — all wheat, barley, oats, rye, mixed grain.
Oil — flax, rape.
Vegetables — canning beans, carrots, sweet corn, onions, green peas, cucumbers.

TABLE 4. DISTRIBUTION OF IRRIGATED LAND AMONG CROP TYPES ON SURVEYED FARMS

Irrigation District	Intensive Crop[1]	Grains and Oilseeds	Forage[2]	Summer-fallow
		– percent –		
St. Mary's River (western)	14	45	32	9
St. Mary's River (eastern)	12	55	30	3
Taber	22	35	30	13
Bow River Development (federal)	20	43	28	9
Bow River Development (provincial)	0	40	39	21
Lethbridge Northern	8	37	42	13
Raymond	13	25	57	5
Eastern	4	28	61	7
Western	0	1	99	0
United	0	0	100	0
All Districts	11	37	44	8

[1] Intensive crops in study refers to sugar beets, potatoes, and vegetables.
[2] Includes hay, silage, and pasture.

from 16.3 percent of the irrigable land and 63 percent of the surveyed farms in the Taber Irrigation District, to 6.3 percent of the land and 18 percent of the farms in the SMRID (eastern). Three percent of the farmers interviewed produced potatoes while 21 percent reported sugar beets. The average acreage of potatoes tended to be much larger than that of sugar beets. Carrots, onions, sweet corn, green peas, and cucumbers were reported in only one to three of the survey districts. Production of these crops is limited to small areas by institutional, market and managerial factors.

A somewhat surprising finding was the relatively high incidence of summerfallow on irrigated land, especially in districts such as the TID where intensive crop production is concentrated. Some factors involved are:

- Weeds – Weeds are a serious problem in irrigated crop areas. The extra moisture from irrigation, irrigation ditches, uncultivated land along such ditches, and the spreading of seed by water foster the weed growth. Weed control is especially critical with sugar beets and vegetables where chemical control is difficult. Summerfallow is used as a weed control measure.

- Rotation requirements for some crops – Sugar beets are usually grown on the same acreage only once every four years to control various plant pests. Land allocated to sugar beets is often fallowed the preceding year to ensure adequate pest control.

- Limited irrigation system capacity – A common management strategy employed especially in areas where sprinkler systems predominate and where cereals are the main irrigated crop, is to seed two thirds of the irrigable acreage, irrigating the stubble crop first and then moving the sprinkler system to the fallow crop. Although a large acreage can be irrigated in this manner, crops typically receive only one water application where this practice is used.

- Seasonal labor requirements – Farmers often allocated part of their acreage to summerfallow to reduce work loads in the planting and harvesting seasons.

CROP YIELDS

Average yields on both dryland and irrigated land vary widely among irrigation districts (Table 5). Since many factors contribute to these differences, it is difficult to make comparisons among districts and crops and between irrigated and dryland crops. For example, irrigated cereal yields were 60 percent higher than dryland yields in the TID and SMRID but only about 25 percent higher in the WID and BRID (federal) in 1973. The greater differences between dryland and irrigated yields occurred in areas that applied water more often (TID – 1.7 irrigations, SMRID (western) – 1.5, WID – 1.0, BRID (federal) – 1.3).

The wide range in cereal yields on both dryland and irrigated land can be attributed to:

1. Soil productivity differences among districts:
2. Relative importance of irrigated versus dryland crop production among districts;
3. Differences in the number of water applications;
4. Local weather conditions in the survey year.

Yields of intensive crops seem to be more uniform because:

1. The area in which specific intensive crops are produced is usually relatively small and has more uniform soil and climatic conditions;

TABLE 5. PER ACRE YIELD DISTRIBUTION OF SURVEYED FARMS, 1973

Crop	Yield on Dryland			Yield on Irrigated Land			Ave. No. of Times Irrigated	Percentage of Crop Irrigated with Sprinklers
	Average by Irr. Dist.		Average for all Dryland	Average by Irr. Dist.		Average for all Irrigated Land		
	Min.	Max.		Min.	Max.			
Soft Wheat (bu)	25	40	34	35	68	57	1.0	67
Hard Wheat (bu)	18	34	24	40	50	46	1.4	53
Barley (bu)	22	54	41	53	66	61	1.4	59
Oats (bu)	20	55	46	56	83	67	1.6	46
Flax (bu)	8	22	17	12	23	21	1.4	45
Mixed Grain (bu)	–	–	–	63	84	80	1.3	28
Cereal Green Feed (T)	1	2.8	1.9	1.3	3.4	2.4	1.7	75
Pasture (AUM)[1]	.75	2.2	1.5	2.2	3.7	2.7	2.3	11
Hay (T)	1	3	1.9	2.6	3.7	3.1	2.3	34
Sugar Beets (T)	–	–	–	13	16	15	4.0	89
Grain Corn (bu)	–	–	–	55	80	62	2.2	36
Silage Corn (T)	–	–	–	10	18	17	2.0	63
Green Peas (T)	–	–	–	1.2	2.7	2	2.1	89
Dry Peas (T)	–	–	–	.5	1	.9	2.0	76
Potatoes (T)	–	–	–	9	13	11	4.2	100

[1] Animal Unit Month — an estimate of the amount of pasture available on surveyed farms.

The following crops were reported in the survey but were too few to determine range of yield and irrigation: rye, mustard, fall rye (forage), cucumbers, canning beans, grass seed, onions, rape, carrots, sweet corn, field beans.

2. Levels of inputs such as fertilizers, water and chemicals are more uniform among farms;

3. Irrigated crop production plays a more important role in the total farm business on intensive crop farms.

NUMBER OF IRRIGATIONS

The average number of water applications varies markedly among crops (Table 5). Cereals and oilseeds are irrigated once or twice, forages and corn two or three times, and sugar beets and potatoes four or five times. Most of the irrigable land is topographically suited to flood irrigation; however, a large proportion of the acreage is irrigated with sprinkler systems. Farmers with sprinkler systems tended to irrigate a higher proportion of their irrigable land. This is attributable to three factors. First, the lower labor requirements of automated sprinkler systems facilitate coverage of a larger proportion of the irrigable land with the same labor force. Second, the high initial investment for a sprinkler system is spread over as many acres as possible in order to pay for the system. Third, sprinklers are used on a high percentage of the intensive crops (sugar beets, potatoes, and green peas), which cannot be produced satisfactorily in southern Alberta without irrigation. The high incidence of sprinkler irrigation for intensive crops reflects farmers' attempts to reduce their dependence on seasonal labor for these crops. Land irrigated by sprinklers varies from 0 and 16 percent of the irrigated land in the UID and EID, respectively, to 73 percent in both the LNID and SMRID (western).

LIVESTOCK ON IRRIGATED FARMS

Livestock enterprises, particularly beef, are important parts of farm businesses on many irrigated farms (Table 6). A large proportion of surveyed farms in all irrigation districts reported substantial cow herds or feeding enterprises.

Surveyed farms reported little dryland hay production indicating that most of the stored forages (hay and silage) are produced on irrigated land. The situation is somewhat different with pasture as less than one third of the total pasture supply was produced on irrigated land.[3] This varied widely among districts. Farms in the RID, SMRID (western), and LNID reported that over half their pasture was irrigated[4] while farmers in the BRID and WID produced most of their pasture on dryland. This is reflected in the differences between total and irrigated acreages among districts (Table 2).

[3] Total pasture supply includes grazing on public lands.

[4] Crop residues (cereal stubble, hay aftermath, beet tops, etc.) are also important fall and winter pasture sources on irrigated land in some districts.

TABLE 6. LIVESTOCK NUMBERS ON SURVEYED FARMS

Irrigation District	Ave. No. Brood Cows	Percentage Reporting Brood Cows	Ave. No. AUMS	Percentage of AUMS from Irrigated Pasture	Ave. No. Calves Fed Out	Percentage Feeding Calves Out	Ave. No. Sows	No. Reporting Sows
St. Mary's River (western)	48	68	209	62	506	76	41	11
St. Mary's River (eastern)	53	76	281	41	106	67	20	16
Taber	58	95	530	22	134	88	9	12
Bow River Development (federal)	64	79	348	26	100	89	12	25
Bow River Development (provincial)	47	85	258	13	87	69	5	8
Lethbridge Northern	37	78	158	71	76	74	27	34
Raymond	80	50	336	57	460	83	7	11
Eastern	114	78	459	22	102	69	45	23
Western	83	82	490	9	42	73	18	20
United	84	64	371	46	108	57	0	0
All Districts	68	77	365	31	176	74	28	18

The production patterns suggest that irrigated crop production is an integral part of a beef-forage-grain production system on many farms.

Farmers in the TID reported the highest pasture supply with an average estimated grazing capacity of 106 cows and calves per farm per season. These same farms reported an average of 58 cows per farm suggesting that pasture feeding of calves and purchased feeders is an important activity in that area. In other districts the estimated pasture supply closely approximated the requirement for the size of cow herd reported. Cattle feeding is also an important activity on many irrigation farms in all districts. About three quarters of the surveyed farms fed an average of 176 head in 1973.

Hog enterprises were operated on substantially fewer farms than were beef enterprises. While some farmers did sell feeder pigs and others bought feeders, the average number of pigs produced corresponded closely to the average output level of the sow population on the surveyed farms. Sow numbers per farm varied from an average of five in the Bow River Development (provincial) to 45 in the Eastern Irrigation District.

SUMMARY

Irrigation farming is often viewed as a distinct and separate part of the agricultural industry in southern Alberta. However, most of the irrigated area is closely integrated with the surrounding dryland agriculture. This is evident from:

1. The large cereal and forage acreage on irrigated land;
2. The large proportion of pasture supply on irrigated farms that is produced on dryland;
3. The large livestock enterprises, especially beef, on irrigated farms;
4. The small proportion of farms (21 percent) reporting intensive crops (i.e., sugar beets, potatoes, and vegetables), and the even smaller irrigated area used for these crops (11 percent).

There is great diversity in irrigated agriculture because of agroclimatic differences among districts, dispersed over an area ranging from the semi-arid plains to the more humid foothills. Irrigation district boundaries seem to have little or no bearing on the crops grown in any area. Institutional factors such as contracts, location of processing plants and related factors are important in determining the production location for crops such as potatoes, sugar beets, and processing vegetables.

The intensity of irrigation varies greatly among crops and areas. In some districts only about half the irrigable land is actually irrigated while in others more than 90 percent is irrigated. In some districts, cereals, hay and pasture are the only crops grown and are irrigated only once. In other areas the range of crops is much wider and input levels (fertilizer, chemicals and water) are much higher. Sprinkler irrigation systems dominate in areas where intensive crops are grown. Flood irrigation methods are used on most of the hay, pasture, and cereal acreage.

CANADA'S AGRICULTURAL TRADE PERFORMANCE IN 1974 AND PROSPECTS BEYOND 1975

J.S. Lohoar*

Canada's agricultural exports reached a record value of $3,813 million in 1974, giving a positive agricultural trade balance of $985 million. This record value was due mainly to higher commodity prices. To maintain a favorable trade performance in the future, it will be necessary that Canadian products be offered on a reliable and continuous basis at competitive prices and that new markets be developed.

INTRODUCTION

In 1974, Canada's agricultural exports exceeded the value of imports of farm products by $985 million. For the same year there was a deficit of $286 million for total merchandise trade; therefore, without the positive balance contributed by agricultural exports, this deficit would have been much larger. During the 1970's the value of farm exports has consistently exceeded the expenditure on imports and the size of the trade balance has shown a strong upward movement (Table 1). This contrasts sharply with the deficit in farm trade experienced as recently as 1969 (1).

This favorable trade performance since 1969 has not been general in all commodity sectors. The figures for all agricultural trade, when broken down, reaveal differing trends in individual farm products. This article reviews Canada's 1974 agricultural trade and examines some of the factors influencing the level of exports and imports during that year. Particular emphasis is placed on the differing trends observed among the various commodity sectors. Prospects for agricultural trade in 1975 are then reviewed on the basis of trade figures available up to the end of June. The implications of the present round of multilateral trade negotiations being held within the General Agreement on Tariffs and Trade (GATT) for the future level of agricultural trade are also considered.

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TABLE 1. VALUE OF CANADIAN AGRICULTURAL TRADE 1950-1974

Year	Exports	Imports	Net Trade Balance
		— million dollars —	
Average			
1950-54	1,012	603	409
1955-59	945	692	253
1960-64	1,264	894	370
1965-69	1,509	1,094	415
1969	1,211	1,246	−35
1970	1,685	1,283	402
1971	1,993	1,299	694
1972	2,135	1,538	597
1973	3,003	2,162	841
1974	3,813	2,828	985

Source: "Canada's Trade in Agricultural Products", Economics Branch Publication 75/12, Agriculture Canada, June 1975.

AGRICULTURAL TRADE IN 1974

EXPORTS

Agricultural exports reached a record value of $3,813 million in 1974, an increase of 27 percent from the

previous record of $3,003 million established in 1973 (2). The major factors influencing exports in 1974 were commodity prices, export volumes, commodities sold and market outlets.

Commodity Price Levels

The sharp increase in the value of exports was due largely to higher 1974 world prices for most agricultural products. World prices of most farm exports remained relatively stable throughout the Sixties but increased sharply in mid-1972 and maintained this higher level during 1973 and most of 1974. The rise in world prices was the result of the combined effect of increased demand in most industrialized countries, reduced grain crops (particularly in the USSR), low inventories in most exporting countries and currency uncertainties in many countries that led to increased speculation on commodity markets. During this period the price index for Canadian exports of food, feed, beverages, and tobacco, which was 100 in 1972, increased to 136 in 1973 and 219 in 1974[1]. Export prices in 1974 were therefore more than double the 1972 level.

[1] Since April 1975, the weighting system used by Statistics Canada for trade price and volume indexes has been changed to correspond with the system used to estimate Gross National Product (GNP) at constant prices. The reference period for the indexes has also been changed from 1968 = 100 to 1971 = 100. These new 1971 trade indexes are based on an expanded set of price indicators selected to represent 1971 trading patterns. Individual price indicators are either commodity unit values calculated directly from the trade statistics or price indexes obtained from other Canadian or foreign statistics (6).

Volume of Exports

While export prices were much higher in 1974, the volume of Canadian farm exports declined significantly. In particular, exports of grains and oilseeds were lower in 1974 than a year earlier. Wheat shipments declined by 18 percent, and barley exports by 26 percent. In the oilseeds sector, the volume of rapeseed exported declined by 48 percent and flaxseed shipments decreased by 19 percent. These declines resulted from lower production and reduced stock levels as well as domestic transportation difficulties. An indication of the general decline in the volume of exports can be obtained from the Statistics Canada volume index of exports of food, feed, beverages, and tobacco[2]. This index was 105 in 1972, fell to 100 in 1973 and further declined to 83 in 1974. This indicates that the volume of exports decreased by 17 percent in 1974.

Commodity Breakdown

Because of the high prices of grains and oilseeds prevailing in 1974, these two commodity sectors made up a large portion of the total value of farm exports. Grains represented over 62 percent of total exports; oilseeds contributed 10 percent. As a result, grains and oilseeds made up over 72 percent of total exports in

[2] The new volume index is derived by dividing the value index by the corresponding current-weighted price index. The resulting volume index is, therefore, weighted with fixed 1971 price weights, as are the measures of GNP components in constant 1971 prices (6).

TABLE 2. CANADIAN EXPORTS OF GRAINS AND OILSEEDS AS PERCENTAGE OF TOTAL AGRICULTURAL EXPORTS, 1950-1974

Calendar Year	Wheat	Barley	Rapeseed	Flaxseed	Total[1] Grains & Oilseeds	Total Agr. Exports	Grains & Oilseeds as % of Total Agr. Exports
			— million dollars —				— percent —
Average							
1955-59	422	77	39	46	581	945	61.5
1960-64	688	41	15	45	816	1,264	64.6
1965-69	758	46	35	49	911	1,509	60.4
1970	684	133	79	56	985	1,685	58.5
1971	830	195	148	64	1,275	1,993	64.0
1972	916	217	125	68	1,371	2,135	64.2
1973	1,218	278	230	113	1,889	3,003	62.9
1974	2,040	323	200	149	2,763	3,813	72.4

[1] In addition to commodities listed, includes exports of oats, rye, corn, buckwheat, mustard seed; grain and oilseed products are not included.

Source: "Canada's Trade in Agricultural Products", Economics Branch, Agriculture Canada, various issues.

TABLE 3. CANADA'S MAJOR EXPORT MARKETS FOR AGRICULTURAL PRODUCTS, 1950-1974.

Year	U.S.A.	Japan	U.K.	E.E.C.[1]	E.E.C.[2]	U.S.S.R.	China	Other	TOTAL
					— million dollars —				
1950-54	304	57	273	144	–	1	–	233	1,012
% of total	30.0%	5.6%	27.0%	14.2%	–	0.1%	–	23.0%	100%
1955-59	226	82	291	154	–	7	1	184	945
% of total	23.9%	8.7%	30.8%	16.3%	–	0.7%	0.1%	19.5%	100%
1960-64	216	122	302	181	–	69	101	273	1,264
% of total	17.1%	9.7%	23.9%	14.3%	–	5.5%	8.0%	21.6%	100%
1965-69	274	163	291	190	–	144	131	316	1,509
% of total	18.2%	10.8%	19.3%	12.6%	–	9.5%	8.7%	20.9%	100%
1970	344	193	275	230	511	89	122	432	1,685
% of total	20.5%	11.5%	16.3%	13.7%	30.3%	5.3%	7.2%	25.5%	100%
1971	332	232	296	328	632	115	193	497	1,993
% of total	16.7%	11.6%	14.9%	16.5%	31.7%	5.8%	9.9%	24.9%	100%
1972	362	275	280	281	568	268	230	439	2,135
% of total	17.0%	12.9%	13.1%	13.2%	26.6%	12.6%	10.8%	20.5%	100%
1973	549	539	328	372	705	285	192	738	3,003
% of total	18.3%	17.9%	10.9%	12.4%	23.5%	9.5%	6.4%	24.6%	100%
1974	530	683	399	524	931	15	340	1,322	3,813
% of total	13.9%	17.9%	10.5%	13.7%	24.4%	0.4%	8.9%	34.7%	100%

[1] Belguim, Luxembourg, France, Italy, West Germany and Netherlands.
[2] Enlarged E.E.C. including United Kingdom, Ireland and Denmark.

Source: "Canada's Trade in Agricultural Products", Economics Branch Publication 75/12, Agriculture Canada, June 1975.

1974 (Table 2). This was the highest proportion contributed by these two sectors since 1955.

Country Breakdown

The disturbed conditions in world commodity markets during 1974 resulted in some marked changes in the relative importance of individual countries as outlets for Canadian farm exports. Japan became Canada's most important single country market for the first time, purchasing farm products valued at $683 million or 18 percent of the total (Table 3). The virtual completion of contract shipments of wheat to the U.S.S.R. resulted in total exports to that country declining sharply from $285 million in 1973 to only $15 million in 1974. Despite increased export prices for most farm products, there was an absolute decline in the value of exports to the U.S., from $549 million in 1973 to $530 million in 1974, with the result that the U.S. proportion of Canada's exports declined to less than 14 percent.

The increased value of exports shipped to non-traditional markets or "other countries" was also a significant feature of the 1974 trade performance. These countries purchased 35 percent of total exports in 1974 (Table 3). This expansion largely reflects increasing exports of Canadian farm products to developing countries. In 1974, 10 countries each imported Canadian farm products valued at more than $100 million. Among these were Brazil, Algeria, and Cuba.

Brazil and Algeria represented important markets for Canadian farm products in 1974, with purchases of wheat valued at $238 million and $128 million. Cuba, a consistent importer of Canadian products, purchased about $106 million worth of agricultural commodities, chiefly wheat, wheat flour, skim milk powder, breeding cattle and tallow. Mexico imported $51 million worth of Canadian products and Venezuela $13 million in the same year. The Caribbean area, comprising Jamaica, Trinidad and Tobago, Haiti, the Bahamas, Barbados and Bermuda continued to be an important outlet for Canadian farm products. These islands imported $38 million worth of goods in 1974, mostly fresh and processed meats, refined sugar, wheat and wheat flour

and processed vegetables. East Asian countries, including Indonesia, Hong Kong, North and South Korea, and the Philippines, have become important markets in recent years. In 1974, they imported $110 million worth of wheat and wheat flour, barley, meat, hides, breeding stock, processed fruits and products, and oilseed products.

Food aid to developing countries makes up part of farm exports, totalling $150 million or four percent of total exports in 1974. However, commercial sales are of considerable importance. It is estimated that in 1974 commercial exports to developing countries as a group were valued at over $900 million or nearly 25 percent of total farm exports. Exports to developing countries have increased in recent years (partly because of unfavourable growing conditions and reduced harvests in some areas), but trade has also expanded as a result of the increased rate of economic growth in many countries, which has allowed them to become more active buyers on world commodity markets. The increased export earnings of oil producing countries have also opened up additional markets for Canadian agricultural exports.

IMPORTS

Canada's agricultural imports also increased significantly during 1974. They were valued at $2,828 million, 31 percent above the 1973 level of $2,162 million.

As with exports, much of the increased value of imports during 1974 resulted from higher world prices for many commodities, rather than increased volumes. Import prices as a whole increased by 39 percent over 1973 levels. The most notable increase was in the price of sugar which, by the end of December 1974, was four times higher than a year earlier. This sugar price increase was the major factor contributing to the increased total value of imports.

The volume of imports as a whole declined by six percent compared with 1973. This was much less pronounced than the decrease in volume of exports. Imports of cattle, beef, lamb, butter, and sugar were lower than in 1973. On the other hand, commodities that were imported in greater volumes included corn, oilseeds, pork and cheese as well as various fruits and vegetables.

Places of origin of farm products entering Canada are considerably less diversified than the destinations of agricultural exports. The U.S. is by far the leading supplier of imported agricultural commodities. In 1974, the U.S. shipped goods valued at $1,578 million or 56 percent of Canada's total imports. Australia was the second largest exporter to the Canadian market, supplying farm products valued at $266 million or nine percent of total imports. No other country shipped more than $100 million worth of goods.

TRADE BALANCE

The record level of farm exports in 1974, despite the substantial increase in imports, brought about a favourable balance in agricultural trade of $985 million (Table 1). This was an increase of 17 percent over the trade balance of $841 million realized in 1973. Agricultural exports are making a significant contribution to the total balance of trade for the economy as a whole. An examination of the trade balances for individual commodities makes clear the contribution of specific commodity sectors to the general balance of agricultural trade. In examining individual commodity sectors it is helpful to divide agricultural imports into supplementary and complementary commodities.

Supplementary commodities (Table 4), usually referred to as competitive goods, consist of imports similar to or the same as agricultural commodities produced commercially in Canada (e.g., sugar). It should be noted that supplementary imports include fresh fruits and vegetables imported during the Canadian "off-season" (that is, those that entered during the duty-free period); these totals are therefore somewhat overstated. In 1974, Canada imported $163 million worth of fresh fruits and vegetables during duty-free periods out of the supplementary total of $2,243 million. In 1973, the total value of fruits and vegetables imported during duty-free periods was $176 million out of the supplementary total of $1,641 million.

Complementary agricultural imports (Table 5), usually referred to as non-competitive, include all agricultural imports other than supplementary. Complementary imports consist mainly of tropical fruits, nuts, spices, fibres, tropical beverages, and rubber.

The data comparing agricultural exports and supplementary imports (Table 4) reveal the key contribution of the grains and oilseeds sectors to the whole trade balance. In 1974, most commodity groups showed a deficit in trade. The exceptions were tobacco, animal products (mainly hides), maple products and seeds for sowing. Therefore the positive contributions of these non-deficit products together with the large grain and oilseed balances were required to offset the deficits in the other sectors.

TABLE 4. CANADIAN AGRICULTURAL EXPORTS AND SUPPLEMENTARY IMPORTS – TRADE BALANCES, VALUE BY COMMODITY GROUPING AND MAJOR COMMODITIES, CALENDAR YEARS 1973 AND 1974

	1973 Exports	1973 Imports	1973 Balance + Exports – Imports	1974 Exports	1974 Imports	1974 Balance + Exports – Imports
	— thousand dollars —					
EXPORTS AND SUPPLEMENTARY IMPORTS[1]						
Grains[2]	1,519,808	87,953	+1,431,855	2,382,613	181,721	+2,200,892
Grain Products (Human)	107,876	36,653	+ 71,223	135,318	61,040	+ 74,278
Animal Feeds[3]	79,920	29,014	+ 50,906	79,114	29,520	+ 49,594
Oilseeds	369,277	78,733	+ 290,544	380,430	131,278	+ 249,152
Oilseed Products	45,529	116,485	– 70,956	44,777	185,600	– 140,823
Animals Living	132,502	128,319	+ 4,183	77,472	97,030	– 19,558
Meats	199,901	223,739	– 23,838	139,562	186,601	– 47,039
Other Animal Products	160,221	130,391	+ 29,830	168,642	155,313	+ 13,329
Dairy Products	89,724	65,529	+ 24,195	65,959	78,598	– 12,639
Poultry and Eggs	17,000	19,113	– 2,113	24,129	24,590	– 461
Fruits and Preparations	34,535	193,839	– 159,304	30,460	206,113	– 175,653
Vegetables and Preparations	74,050	212,842	– 138,792	75,661	263,223	– 187,562
Seeds for Sowing	21,993	16,447	+ 5,546	26,557	22,346	+ 4,211
Maple Products	7,341	– –	+ 7,341	6,531	– –	+ 6,531
Sugar	13,624	167,942	– 154,318	21,012	441,979	– 420,967
Tobacco, Raw	56,741	8,856	+ 47,885	71,255	9,875	+ 61,382
Other Supplementary Products	62,186	125,578	– 63,392	70,109	168,328	– 98,219
SUPPLEMENTARY TOTALS	2,992,228	1,641,433	+1,350,795	3,799,601	2,243,153	+1,556,448

[1] Supplementary commodities consist of imports similar to or the same as agricultural commodities produced commercially in Canada. Supplementary imports include fresh fruits and vegetables imported during the Canadian "off-season" (i.e., duty free period.)
[2] Excludes seed wheat and seed oats (included in seeds for sowing).
[3] Excludes oilcake and meal (included in oilseed products).

Source: Calculated from "Canada's Trade in Agricultural Products", Economics Branch Publication 75/12, Agriculture Canada, June 1975.

The major trade deficits in 1974 were in sugar, fruits, vegetables and oilseed products (mainly vegetable oils), and they were chiefly caused by increased import prices. For livestock and livestock products, exceptional circumstances caused exports to drop below imports. In the dairy sector, traditional exports of aged cheddar cheese were severely curtailed as a result of Britain's accession to the European Economic Community (EEC) and the consequent imposition of a levy on Canadian cheese entering Britain. However, a special arrangement has been reached with the EEC, providing for a reduced import levy on aged cheddar cheese, and this has been in effect since April 1, 1975. Since no levy will apply to aged cheddar cheese shipments to Britain during the 1975/76 EEC dairy year, there are prospects that cheese exports to Britain will recover. In the case of livestock and meat, the normal two-way flow of trade between Canada and the U.S. was adversely affected by quota restrictions. The quotas regulating trade in live slaughter cattle, hogs and pork were removed in August, and trade in these commodities is likely to increase during the rest of the year. Beef quotas remain in effect. Normal trade patterns for poultry and eggs were changed by the introduction of national supply management programs for eggs and turkeys.

The exports that are shown together with imports of complementary products in Table 5 have not been produced in Canada but are commodities that have been processed here or are re-exports of items previously imported. They are not of major significance. The table shows that imports of food items that cannot be produced in Canada amounted to $585 million in 1974. They mainly consist of tropical fruits and nuts, cotton and plantation crops (coffee, tea, cocoa, rubber).

1975 TRADE PROGRESS

It is probable that Canada's agricultural trade in 1975 will show some increase in the volume of both exports and imports, although commodity prices in general are likely to show some decline as compared with 1974.

Despite the lower rate of economic growth in many major importing markets, Canadian exports of farm

TABLE 5. CANADIAN AGRICULTURAL EXPORTS AND COMPLEMENTARY IMPORTS – TRADE BALANCES, VALUE BY COMMODITY AND MAJOR COMMODITIES, CALENDAR YEARS 1973 AND 1974

	1973			1974		
	Exports	Imports	Balance + Exports – Imports	Exports	Imports	Balance + Exports – Imports
			– thousand dollars –			
EXPORTS AND COMPLEMENTARY IMPORTS[1]						
Fruits and Preparations	– –	168,032	–168,032	– –	183,742	–183,742
Citrus fresh or processed	– –	120,551	–120,551	– –	129,553	–129,553
Bananas	– –	37,736	– 37,736	– –	41,515	– 41,415
Nuts	1,007	38,737	– 37,730	501	44,316	– 43,815
Vegetable Fibres	2,629	74,865	– 72,236	4,011	77,563	– 73,552
Cotton Raw	1,200	65,181	– 63,981	1,282	66,349	– 65,067
Plantation Crops	5,958	224,050	–218,092	7,078	258,317	–251,239
Coffee and Products	4,903	123,999	–119,096	5,605	131,685	–126,080
Tea and Products	2	25,291	– 25,289	412	29,882	– 29,470
Cocoa Beans and Products	– –	27,387	– 27,387	– –	37,589	– 37,589
Rubber	– –	36,651	– 36,651	– –	46,253	– 46,253
Other Complementary Products	1,062	15,752	– 14,690	1,938	21,321	– 19,383
Spices	942	10,399	– 9,457	1,600	13,175	– 11,575
COMPLEMENTARY TOTALS	10,656	521,436	–510,780	13,528	585,259	–571,731

[1] Complementary imports include all agricultural imports other than supplementary.

Source: Calculated from "Canada's Trade in Agricultural Products" Economics Branch Publication 75/12, Agriculture Canada, June 1975.

products are likely to remain high during 1975. The demand for grains is expected to remain strong following the recent purchases on the world market by the U.S.S.R. On the other hand the value of exports of oilseeds and oilseed products could be lower, owing to the combined effect of declining world prices, an easing in demand in Japan and increased competition from other oilseeds.

Agricultural imports are likely to be maintained at recent levels, but the prices of some imported farm products will be lower than in 1974. In particular, sugar prices have declined significantly and as a result the cost of sugar imports should be substantially lower during the current year.

For the first half of 1975, the value of agricultural exports at $1,871 million was four percent higher than a year earlier. For the same period, imports had reached $1,453 million, an increase of nine percent over 1974.

AGRICULTURAL TRADE PROSPECTS AND THE MULTILATERAL TRADE NEGOTIATIONS (MTN)

An important influence on Canada's agricultural trade in future years will be the outcome of the trade negotiations currently being held under the auspices of GATT in Geneva. After several years of preparations, meetings are now under way in the Multilateral Trade Negotiations (MTN), or Tokyo Round, the first world trade talks since the end of the Kennedy Round in 1967, and the most ambitious and complex since the GATT was drawn up in 1948. Although the MTN encompasses all aspects of international trade, trade in agricultural products will be an important element in the negotiations as a whole.

Canada has a strong interest in comprehensive and meaningful agricultural negotiations within the MTN. Export earnings already provide over 40 percent of total farm cash income. A reduction in foreign barriers to trade in agricultural products should provide Canada with a fair opportunity to expand exports of those products and their derivatives in which she enjoys or could develop a competitive advantage: e.g., grains, oilseeds, vegetable oils and meal, forage seeds, selected livestock products, seed and table potatoes, aged cheddar cheese, apples, and others (3).

An objective for agriculture in the MTN might well be an attempt to establish a framework for international agricultural trade that would encourage expansion of economic production and thereby increase the security

of supply of agricultural products at reasonable prices. This could be achieved by:

- obtaining substantial improvements in and continuing assurances of access to world markets by the dismantlement of tariff and non-tariff barriers;
- eliminating export subsidies and other aids to exports;
- where appropriate for certain commodities, developing commodity arrangements that contain a range of elements affecting trade;
- developing effective measures to prevent the erosion of undertakings on improved access to markets following the completion of the negotiations.

In the meetings up to mid-summer, the Trade Negotiations Committee has established a number of working groups, including one on agriculture. This group has in turn set up three sub-groups on grains, meat and dairy products. The sub-group on grains has met to study the three interrelated topics of stabilization of prices and markets, greater liberalization of trade, and the special position of developing countries. The sub-group on meat is dealing first with trade in bovine meat (including live animals) and is carrying out an analysis of the characteristics, structure and problems of the world meat trade, including the direct or indirect impact of trade barriers and trade-distorting practices. The sub-group on dairy products held its first session in June. It agreed to encompass all dairy products, but to emphasize initially anhydrous milk fat and butter, cheese traded internationally, dried milk (skim milk powder and whole milk powder) and casein. It is also undertaking an analytical study of world trade in dairy products as the first stage of the negotiations.

Results from these negotiations are not expected immediately since many complex issues must be resolved before new trading arrangements for agriculture can be introduced. Furthermore, the removal of trade barriers is likely to be a difficult and gradual process in view of the social and economic adjustment problems facing agriculture in many countries. The difficult problems militating against a rapid move to free trade for farm products have recently been reviewed in a report of the Economic Council of Canada concerning a new trade strategy for Canada (4).

OUTLOOK

An objective of this article has been to identify more precisely some of the commodity areas where opportunities exist for increasing exports as well as expanding the output of commodities that can be produced domestically but are now being imported. The large contribution to total earnings made by exports of grains and oilseeds tends to obscure trade patterns for these other commodities. A consideration of trade flows on a disaggregated, product basis indicates commodity areas, such as meat and various other livestock products, where there is potential for growth.

Continued growth in imports of some agricultural products can be expected as domestic incomes and population increase. In order that this growth in imports can continue to be matched by an expansion in exports it will be important to take advantage of all available measures to promote and expand export sales of farm products. In order to increase sales to traditional export outlets, and also to gain entry to new markets, it will be important to take positive action in all areas of international marketing. This will encompass increased production efficiency to allow pricing at competitive levels, undertakings to supply on a reliable and continuous basis as well as market promotion and development. Since the early 1970s a number of federal government programs have been initiated with the objective of achieving these improvements. These programs have included the Market Development Fund with an annual funding of up to $10 million and the Agricultural and Food Products Market Development Assistance Program as well as a number of programs initiated by provincial governments. The effect of these and other programs has been reviewed in a recent research report by the U.S. Department of Agriculture (5).

Among Canada's objectives at the MTN are improved terms of access to world markets and greater stability for commodity prices. However, these advances may not be achieved at once. Therefore, for the remainder of the 1970s it will be essential to place emphasis on initiatives to develop new markets and to ensure that our traditional markets are served in the most efficient manner possible. By these means the positive balance in trade in agricultural products that has prevailed in the 1970s up to now can be maintained.

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4. Looking Outward – A New Trade Strategy For Canada, Economic Council of Canada, July 1975.

5. Canada's Export Market Development for Agricultural Products, Foreign Agricultural Economic Report No. 107, Economic Research Service, U.S. Department of Agriculture, May 1975.

6. Summary of External Trade, Statistics Canada, Catalogue 65-001. Monthly, June 1975.

POLICY AND PROGRAM DEVELOPMENTS

AGRICULTURAL STABILIZATION ACT (ASA)

Amendments

This legislation, first introduced to Parliament on February 10, was given Royal Assent and became effective on July 30.

The amendments to the act provide for guaranteed returns to farmers, on a list of specified commodities, of 90 percent of the five-year average weighted price adjusted according to trends in the cost-of-production index. Commodities that must be supported at not less than that level are: cattle, hogs and sheep; industrial milk and cream; corn and soybeans; and oats and barley produced outside the Canadian Wheat Board area.

The legislation also gives the Cabinet authority to apply stabilization programs to any other farm commodity as recommended by the Agricultural Stabilization Board.

Other amendments provide for stabilization programs for commodities that have regional markets, and for provincial and producer participation in stabilization programs.

Manufacturing Milk and Cream Stabilization Order 1975-76

By this new order, under the ASA, the Agricultural Stabilization Board may, between April 1, 1975 and March 31, 1976, transfer to the Canadian Dairy Commission an amount not exceeding $267.6 million to pay subsidies to dairy farmers. Present subsidies are paid on shipments reported by processors up to a producer's market-sharing quota. The other change introduced in this order is the increase in the prescribed price for manufacturing milk from 248.9 percent to 266.2 percent of the base price.

Original payments are made about the eighth of each month for manufacturing milk, about the twelfth for cream, and about the eighteenth for fluid milk. In the last case the subsidy is paid only on 95 percent of the portion of milk used for industrial purposes.

FARM CREDIT ACT

Amendments (formerly Bill C-34). Proclaimed May 8, 1975.

Amendments to Farm Credit Regulations. Canada Gazette June 25.

The new amendments to the act, including benefits to young farmers and those hoping to become farmers, were summarized in the June issue of Canadian Farm Economics.

The regulations under the act were also amended to define further the conditions under which loans are made. For example, Section 15 of the new regulations states "the amount of a loan made under Part III or Part IV (of the act) may exceed 90 percent of the appraised value of the farm lands or farm lands and chattels on the security of which the loan is made," when the primary purpose of the loan is to assist a young person to become established in farming or to develop a farm enterprise.

PRAIRIE GRAIN ADVANCE PAYMENTS ACT

Amendment No. 2, formerly Bill C-53

This amendment increased the maximum advance payment to a producer for financing the drying of damp or tough grain to either 25 cents a bushel or $1,500, whichever is the lesser, and increased the maximum advance payment on unthreshed grain to $7,500. The former maximum payments were respectively 10 cents a bushel or $600, and $3,000. The new payments became effective on August 1, 1975.

(Amendment No. 1, originally Bill C-10, was given Royal Assent on March 24, 1975. It increased the maximum cash advance from $6,000 to $15,000.)

TWO-PRICE WHEAT ACT

Wheat Producers Determination Regulations

Regulations complementing the recently enacted two--price wheat legislation were proclaimed in effect July 1, 1975.

Producers of wheat in Canada are guaranteed $3.25 a bushel for wheat sold for domestic human use by a statute, which sets this amount as the price millers must pay for wheat in Canada. Under the act the government is authorized to pay up to $1.75 a bushel to producers to bring their returns up to the level they could expect if their wheat had been sold for export.

AGRICULTURAL PRODUCTS CO-OPERATIVE MARKETING ACT

Wheat Marketing Agreement (Ontario)

An agreement on initial payments to producers, between the federal government and the Ontario Wheat Producers' Marketing Board, which has provincial authority for the marketing of Ontario wheat.

Under the 1975 agreement the federal government guarantees producers an initial payment of $2.01 a bushel, based on No. 2 Canada Eastern Wheat at 14 percent moisture, for the 1975-76 crop year. (There is no change in the amount from last year). Discounts are allowed for lower grades and higher moisture contents. (Western producers are guaranteed an initial payment of $2.25 a bushel under the Canadian Wheat Board Act for western wheat sold in the present crop year). Under the Ontario agreement guaranteed costs of handling, processing and selling are not to exceed an average of $33^1/_3$ cents a bushel. The agreement remains in effect until June 30, 1976.

Ontario Bean Agreement

This agreement, effective to December 31, 1975, authorized the Minister of Agriculture to enter a plan with the Ontario Bean Producers' Marketing Board for the co-operative marketing of the 1975 crop of Ontario pea beans and yellow-eye beans. The prescribed initial payment of $7.06 a hundredweight is approximately 45 percent of the three-year average price to producers.

FARM PRODUCTS MARKETING AGENCIES ACT

New Egg Marketing Regulations (As approved by the National Farm Products Marketing Council)

• CANADA EGG PURCHASING LEVIES ORDER

This amendment to the Egg Purchasing Levies Order increased the purchasing levy to two and a half cents from half a cent a dozen, effective July 28.

The purchasing levy is additional to the ordinary levy of one cent a dozen imposed by the Canadian Egg Marketing Agency (CEMA). The levy, which varies according to seasonal demands for eggs, enables CEMA to pay for handling of within-quota surpluses. CEMA maintained a purchasing levy of three and a half cents up to November of 1974, then reduced it to half a cent. The purchasing levy plus the ordinary levy then totalled one and a half cents. The new levy is expected to remain in effect until December 31, 1975.

• CANADIAN EGG PRICING (INTERPROVINCIAL AND EXPORT) REGULATIONS

The act gives CEMA authority to fix the price of table eggs in interprovincial and export trade. The price affected is that paid to the producer by the primary buyer, whether a grading station owner or a wholesaler.

Under the agreement each province charges the same price for eggs sold within the province and those sold outside. The regulation remains in effect until October 31, 1975.

• CEMA QUOTA REGULATIONS (Amendment)

This amendment continues the present quota until December 31, 1975. The quota is approximately 430 million dozen eggs for all purposes, including hatching, table use and manufacturing of egg products, and including eggs from regulated and unregulated producers

AGRICULTURAL PRODUCTS MARKETING ACT (APMA)

These three recent orders are examples of the legal procedure for giving provincial marketing boards either new federal authority or revised forms of federal authority to control the marketing of a commodity in another province or outside Canada, and to collect levies from producers. The necessary authority is given by an initial Order in Council. Regulations and specific terms must then be spelled out in subsequent orders. These federal orders must be made public in the Canada Gazette.

QUEBEC EGG ORDER

This is a new agreement for the commodity board concerned, the Quebec Eggs for Consumption Producers' Federation (Fédération des producteurs d'oeufs de consommation du Québec). It is similar to agreements already signed under APMA by Alberta, Saskatchewan, Ontario, New Brunswick and Nova Scotia. Marketing boards in these provinces are now authorized to collect levies from producers within the province, in order to meet their obligations to CEMA. The Quebec Egg Order came into force on June 12, 1975.

ONTARIO GRAPES-FOR-PROCESSING ORDER

This order gives federal authority to the Ontario Grape Growers' Marketing Board to regulate the marketing of grapes for processing in interprovincial and export trade. (The board already has authority under provincial legislation to market such grapes within the province). The order also authorizes the board to collect levies from producers in Ontario and to classify producers into groups for fixing different levies.

MANITOBA CHICKEN ORDER

The Manitoba Chicken Broiler Producers' Marketing Board has authority under provincial law to regulate the marketing of chickens within the province (Natural Products Marketing Act of Manitoba). This federal order, which is similar to others under APMA, gives the board authority to control interprovincial and export trade in chickens.

CANADA GRAIN ACT

Canadian Grain Regulations

Earlier changes in grain regulations were summarized in the April issue of Canadian Farm Economics.

The government announced on July 10 that new charges for elevating and cleaning grains at terminals would become effective on August 1, 1975. These increased maximum tariffs, authorized by revisions of the Canada Grain Act, will contribute to the increase in operating revenues that the Canadian Grain Commission estimates will be needed by terminal elevators in the 1975-76 crop year.

Revisions are as follows:

1. Old Schedule B is now Schedule VII. This revision authorizes an increase of one and a half cents a bushel in the minimum tariff at primary elevators for the combined elevator services of receiving, elevating and loading out grain. The new 12 cent minimum tariff will be uniform for all grains.

2. Old Schedule C, now Schedule VIII. Authorizes terminal elevators to charge half a cent more a bushel for elevation of wheat, oats, barley, corn, rye, flaxseed, rapeseed and mustard seed, and five cents more for sunflower seed, buckwheat and other grains and screenings. This revision also authorizes terminals to charge up to five cents a bushel for cleaning grains. (Previously there was a multiplicity of cleaning charges, ranging from nothing to five cents a bushel, depending on the type of grain and the level of dockage. When dockage was less than three percent, for example, there was no charge for cleaning wheat at a terminal elevator).

This is the most significant provision for producers, since actual cleaning charges will no longer be buried in the elevation tariff and producers can now determine the actual cleaning charge from their cash ticket.

3. Old Schedule H, now Schedule XIII – old section 55, new section 56. This revision ends the requirement that terminal elevators must make returns for screenings removed from carloads of grains received by them. Under the old Schedule IV and the old Section 55, when the percentage of screenings assessed as dockage was equal to or greater than three percent of the gross weight of a shipment of wheat, oats or barley, the terminal was required to make returns to the shipper of all but half of one percent of the screenings. This is no longer applicable.

RECENT FEDERAL AGRICULTURAL PROGRAMS

Sour Cherry Assistance

A special program to assist growers of sour cherries in Ontario was announced on July 18. The Agricultural Products Board agreed to buy part of this year's crop in frozen pitted form to help stabilize returns to producers. The cherries were to be stored and sold later on the domestic market. This action was made necessary by an unusually heavy sour cherry crop in North America. With Ontario processors refusing to contract for cherries at the current price of 15 cents a pound, there was danger of the crop being abandoned in the orchards.

Potato Assistance

On April 1 the government began paying eastern potato farmers $1.67 a hundredweight for all Canadian No. 1 potatoes sold during the rest of the season.

Potato Breeding Sub-Station

A major centre for potato breeding was opened on July 23 at Benton Bridge, N.B. It occupies 850 acres of field and forest, 50 miles northeast of Agriculture Canada's Research Station at Fredericton. It has facilities for growing, storing, grading, handling, laboratory study and conferences. It will develop varieties for domestic use and export.

Rapeseed Development

Under Agriculture Canada's New Crop Development Fund (started last year), the Rapeseed Association of Canada was alotted $446,919 for a three-year project aimed at improving yield and quality of low erucic acid rapeseed in Alberta, Saskatchewan and Manitoba.

Funds for Peanut Study

The government plans to pay some $284,000 over two years on a feasibility study of peanut production in southern Ontario. The University of Guelph was given a preliminary grant last year to start the study under the New Crop Development Fund. Peanuts are being studied as an additional source of protein and oil and as an alternative crop for farmers. They can be grown in rotation with tobacco. The need is to develop a variety that will mature in the limited growing season. The Ontario Flue-Cured Tobacco Growers' Marketing Board is also studying the potential of peanuts.

New Crop Varieties Licensed

Early in the summer Agriculture Canada announced the licensing of Dufferin flax (a high-yielding, rust-resistant variety), rapeseed R-500 (to meet the demand for erucic acid content of over 50 percent) and soybean varieties Harlon and Harcor (bred to produce high-yielding beans).

PUBLICATIONS

Readers: When ordering publications, please write to the address under the appropriate section.

Economics Branch

Available from Publications Manager, Room 303, Sir John Carling Building, Ottawa, K1A 0C5.

Co-operation in Canada. J. M. Sullivan. Publ. 75/5. 28 p. Free.

Provincial Legislation Pertinent to Agriculture – Newfoundland, Nova Scotia and New Brunswick. A.R. Jones. Publ. No. 75/7. 70 p. Free.

Provincial Legislation Pertinent to Agriculture – Ontario 1974. A.R. Jones. Publ. No. 75/8. 39 p. Free.

Selected Agricultural Statistics for Canada. R. Daviault. Publ. 75/10. 137 p. Free.

Canada's Trade in Agricultural Products 1973 and 1974. D.L. Bolton. Publ. No. 75/12. 64 p. Free.

The Yorkton Region of Saskatchewan. Prairie Regional Studies in Economic Geography No. 21. H.R. Fast and D.A. Neil. Publ. No. 75/4. 207 p. Free.

AGRICULTURE CANADA

Available from the Information Division, Agriculture Canada, Ottawa, K1A 0C7.

Combines Operation and Adjustment. Ottawa, 1972, revised 1975. Publ. 1464. 34 p.

Agricultural Lands in Southern Quebec: Distribution, Extent and Quality. P.G. Lajoie. 1975. Publ. 1556. 62 p.

Irrigation on the Prairies. K.C. Korven and W.E. Randall. **Federal Provincial Publication. 1972, revised 1975. Publ. 1488. 26 p.**

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The Agricultural Productivity of the Soils of Ontario and Quebec. J.L. Nowland, Ottawa, 1975. Monograph No. 13. 19 p.

Annual unload report, fresh fruits and vegetables on 12 Canadian markets, 1974. Ottawa, 1975. 135 p. Bilingual. Production and Marketing Branch. Cat. No. A71 – 7/1974. Free.

HOUSE OF COMMONS

Available from Information Canada, 171 Slater St., Ottawa, K1A OS9.

Bill C-50 – Agricultural Stabilization Act, an Act to amend. As passed July 10, 1975. 6 p. Cat No. XB301-50/3. 15¢ a copy.

Bill C-53 – Prairie Grain Advance Payments Act, No. 2, an Act to amend. As passed July 8, 1975. 3 p. Cat. No. XB 301-53/3. 15¢ a copy.

FOOD PRICES REVIEW BOARD

Available from the board at 165 Sparks St., P.O. Box 1540, Station B, Ottawa, K1P 5Z5.

Food Prices Review Board, Quarterly Report. Ottawa. July 1975. Bilingual. English text 30 p. Cat. No. RG 27-2/1975-2. Free. (Contents: Recent price trends; crop situation and outlook; meat, poultry and dairy situation; cost elements in the food chain).

Feed Grains, Forage and Food Supplies. Ottawa, June 1975. 23 p.

OTHER PUBLICATIONS

A Survey of Custom Farmwork Rates in Ontario, 1975. Fisher, G.A. and L.L. Davies. Ontario Ministry of Agriculture and Food. April 1975. 17 p. *Write O.M.A.F., Queen's Park, Toronto, M7A 1B2.*

Economic Council of Canada, annual report, fiscal year 1974/75. Ottawa, 1975. 72 p. Paper cover. Also French. Cat. No. EC1-1975. Free. *Write ECC, 333 River Rd., Vanier Ont. Box 527, K1P 5V6.*

Canadian Grain Commission, annual report, 1974. Ottawa, 1975. 55 p. Paper cover. Also French. Cat. No. A91-1/1974. Free. *Write the commission at 303 Main St., Winnipeg, R3C 3G8.*

Farm Real Estate Market Developments. July 1975. 34 p. Economic Research Service. U.S.D.A. *Write U.S.D.A., Washington, D.C. 20250.*

DEFINITIONS

The following definitions are provided to help readers better understand the articles in this issue.

Article No. 1

Summerfallow – A common cultural practice on the Prairies whereby some of the farmland is left idle each year. This land is tilled to control weeds, particularly in the more humid regions, and moisture is conserved, especially important in the more arid parts of the Prairies.

Annual Net Rotation Value – The average annual return to land investment and management calculated in the analysis as follows:

Sum of the annual receipts (yield per acre multiplied by price per bushel) for each crop included in the rotation divided by the length of rotation

minus

Sum of the annual expenses of summerfallowing and producing each crop included in the rotation divided by length of rotation.

Article No. 2

Irrigable land – is land for which a farmer has "water rights" or the right to irrigate.

Irrigated land – is irrigable land that actually had water applied by various forms of flood or sprinkler systems.

Article No. 3

Re-Exports – Statistics of re-exports include only goods previously included in import statistics that are exported from Canada in the same form as when imported. Minor operations such as sorting or blending are not considered as changing the condition of imported goods.

Access – Circumstances in an importing country that determine the extent to which external supplies can compete directly with domestic production. Such factors as tariff levels, non-tariff barriers like quotas as well as domestic support policies are the main determinants of access to individual markets.

IN REPLY

Several readers have written to comment on the February issue, which carried the outlook on farm inputs for 1975.

David Ward, a district agriculturist with Alberta Agriculture in Edmonton, says the February issue was "well-written, easy to read and digest". He commends P.J. Moore for writing for the reader. "I appreciate that economics is not the easiest subject to prepare articles on, but far too many of your authors seem to be writing for 'other economists' and not the agriculturist", adds Mr. Ward.

Jon Waern, a beef farmer from R.1 Val Caron, Ontario, says that CFE helps farmers broaden their horizons provided articles are written for farmers. Mr. Waern adds that the article on feeding (December 1974, by Sonntag and Hironaka) should be used "as a model when expounding on other subjects".

Dr. R. David Clark, Director of the School of Agriculture, Lethbridge Community College, Lethbridge, Alberta, found the article on "Agricultural Manpower" useful and suggested that it would be valuable to consider "what emphasis should be placed in training programs – i.e., management, finance." The author, R.S. Rust, answers, "While training programs may be of interest in relation to farm manpower, the major emphasis for Situation and Outlook is on the supply of labour. Training programs that are established already are usually attended more by farmers themselves than by the labour they hire."

Another reader who found the February issue of particular interest was R.W. Lodge, Chief, Land Use Service, Regina.

Rudy Susko, an agricultural economist in Edmonton, took issue with several points in "Input Substitution and Productivity in Canadian Agriculture." His comments were given to the author. Donald M. MacKay, farm management consultant, P.E.I. Department of Agriculture and Forestry, wrote about the same article, asking if information about annual growth rate changes similar to that in Tables 1, 2, 3 and 4 is available for provinces or regions. The author replies, "Similar data will be available on a regional basis for the Outlook Conference this fall."

T.J. Langwatt, a management consultant with Stevenson and Kellogg in Toronto, says it was "a very useful publication". He also suggests that an annual index of CFE articles by subject area would be helpful.

The editor thanks these persons for writing. Particularly valuable are the comments on target audience and the importance of writing for the reader. Canadian Farm Economics is intended for a varied audience and attempts to strike a balance between technical and non-technical articles. Simplicity of writing is something everyone should strive for, and the editor will endeavor to convey this to authors. We hope you have found this issue interesting and useful.

IN REPLY TO AUTHORS AND EDITORS REGARDING AUGUST '75 *CANADIAN FARM ECONOMICS*

I have read the following article(s):

(1) Economic Analysis of Grain and Oilseed Production in Western Canada
(2) Characteristics of Irrigated Farms in Southern Alberta
(3) Canada's Agricultural Trade Performance in 1974 and Prospects Beyond 1975

My comments are on article number

This article was: not useful 1 2 3 4 5 6 7 8 9 10 very useful.

Because (e.g., The most important economic and social factors were studied. The work was well documented and the conclusions were useful to me).

Beefs Bouquets (Suggestions to authors, publications committee and editors)

My comments may ( ) may not ( ) be used in a future issue of this publication if the editor wishes.

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CANADIAN FARM ECONOMICS

Agriculture Canada

HON. EUGENE WHELAN, MINISTER – L. DENIS HUDON, DEPUTY MINISTER

Canadian Farm Economics is published bi-monthly by the Economics Branch, Canada Department of Agriculture, Sir John Carling Building, Ottawa, and is based on material prepared by economists of the Economics Branch.

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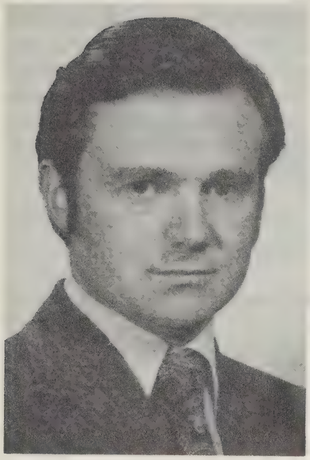
Letters from readers: Letters are encouraged and should be addressed to the author or the Managing Editor. Responses . . . comments, suggestions and points of view are important for effective two-way communications. Letters may be used in the following issue of CFE and will be edited prior to publication where necessary.

FARM FOOD MARKETING COSTS



The marketing bill for food is the difference in the cost of food between the time it leaves the farm and the time it is purchased for consumption. It includes transportation, processing, packaging, grading, retailing, etc.

A change in the marketing bill does not necessarily imply an equivalent change in the profits of marketing firms.

*A.H. Langman**

INTRODUCTION

In recent months, considerable attention has been focussed on the retail cost of food items, and in particular, on the marketing margins that are added to the cost of food after it leaves the farm gate. The size of the marketing bill, and latterly, the farm share of total food costs have frequently been used as the basis for charges of excessive profiteering within different sectors of the food system. This general tendency for consumers, marketers and farmers alike to draw conclusions from the above two parameters alone, will be discussed in this paper.

While the following pages show there have been some shifts in the relative percentages of the 'farm share' and the 'marketing share', the principal thrust of this article is to point out that conclusions regarding profitability and excessive wealth based on the above two criteria in isolation, can be misleading. Suppose a particular type of food in the future were synthetically produced in a factory under controlled conditions, using single cell protein as raw material. The entire cost of such a food would appear in the 'marketing share' of the total bill, simply because farm output has been defined as food produced by an individual or group of individuals whose livelihood comes from working the land. It is highly likely that in the not too distant future, more food will be synthetically produced using fast breeding single cell protein, in order to meet the world's needs.

Canadian Farm Economics in 1973 published an article regarding food marketing costs.[1]. That analysis has been expanded and updated and new data are presented here. Some sectors of the total food bill have now been disaggregated into their component parts. These sectors are fruit (fresh and processed), vegetables (fresh and processed), poultry (excluding ducks and geese), eggs (fresh only), and beef (six major cuts). Because of refined methods of calculation, some of the figures listed in this article will vary slightly from those published in 1973. These are principally in the area of consumer expenditures[2].

THE MARKETING BILL

What is normally referred to as the marketing bill for food is the difference in the cost of food between the

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[1] "Farm Food Marketing Costs", P.J. Moore, Canadian Farm Economics, Vol. 8, No. 4, August 1973.

[2] This is a result of the aggregative method of arriving at the retail value of some commodities, i.e. the retail value of all tomatoes sold is determined by establishing the percentage sold as fresh, canned, juice, paste and ketchup, taking into account conversion and waste factors, assigning retail prices to each product and aggregating the sum.

time it leaves the farm and the time it is purchased for consumption. Much activity takes place between these two points, however, and it is the frequent lack of appreciation of this activity that leads to pointed questions as to why the marketing bill for food is so 'large', why the farmer receives so 'little', and who the mysterious middle-men are.

In recent months, where in some cases there has been an increase in the farmer's share of total food cost, the argument has been reversed and some consumers now feel the farmer is getting too much for his produce. In other words, there is clearly a desire on the part of many consumers to ascribe the recent rise in food costs to some readily identifiable 'villain' in the system.

If everyone purchased all his food directly from the farmer or producer, there would be no need of any further marketing, and hence no marketing bill. However, such a food distribution system would be both highly impractical and inefficient. All raw food would be transported directly to the consumer's kitchen where it would need to be prepared for consumption. In practice, the functions of transporting, processing and packaging, and retailing have been relegated to specialists who can bring food to consumers at less cost than if consumers were to perform these functions themselves.

It should also be noted that by the time most food produce reaches the consumer, it is in a much different form than when it left the farm. The consumer is not just buying the same food at a higher price. In many cases, such as in a meat pie, many products are processed, mixed, and baked to achieve the final product. Some of the ingredients are transported across Canada, and in fact some are imported.

This then is the marketing bill –– transportation, storage, grading, processing, wholesaling and retailing. These functions are as necessary to the 20th century consumer as the seeding, fertilizing and harvesting of a crop. The breakdown of food costs into farm share and marketing share tends to be academic and divisive since both areas should be looked upon as necessary steps in the logical progression from one stage to another until an acceptable product is offered for sale.

Conceptual Problems

A number of conceptual problems were encountered in disaggregating the food marketing bill. Three areas that present the most problems are the dairy sector, breaking eggs, and the bakery sector. For example, a percentage of all eggs produced are destined for breaking. Breaking eggs are channelled in liquid, dried, frozen white and frozen yolks, depending upon market requirements. To determine the retail value of each product, one must calculate the percentage of a product used as an input in the manufacture of another product. For example, one must calculate the percentage of dried egg used in the pastry of a meat pie and estimate the value of the pastry vis a vis the retail cost of the whole pie. The same conceptual problem arises in determining the amount and cost of dried milk powder used in retail cake mixes, ice cream mix, or donut mix.

It is for these reasons that some sectors of the total food bill have not yet been disaggregated.

Consumer Expenditures on Domestic Farm Foods

Consumer expenditure on Canadian produced farm food increased by 83.4 percent from 1966 to 1973, from $6.1 billion to $11.3 billion (Table 1). The increase from 1972 to 1973 was 18.8 percent, or $1.8 billion.

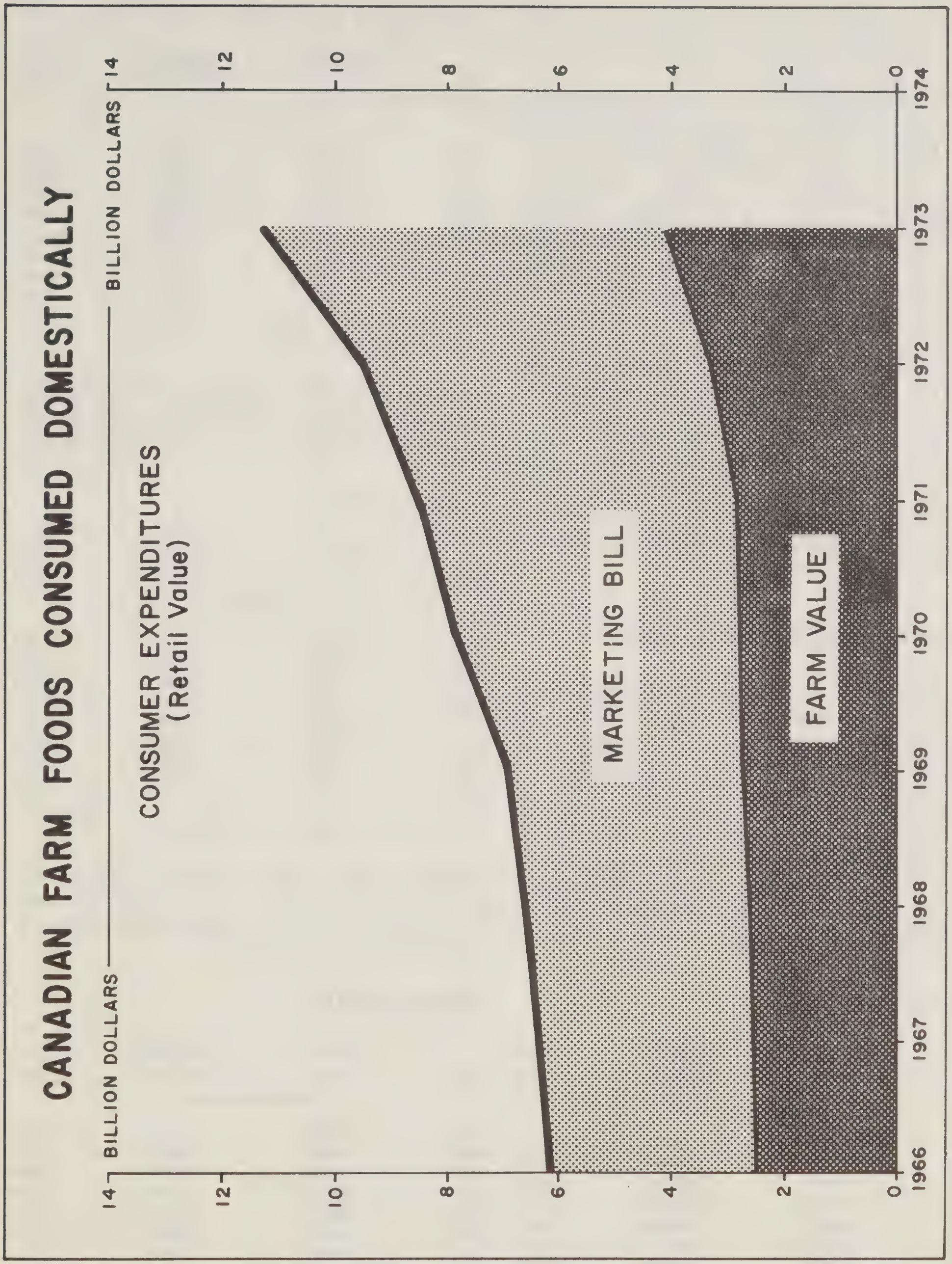
As a percentage of disposable income, the expenditure on Canadian produced farm food decreased marginally from 15.4 percent in 1966 to 14.9 percent in 1973.

The farm value of Canadian produced farm food increased by 66.7 percent in the period 1966 to 1973,

TABLE 1. CONSUMER EXPENDITURES ON CANADIAN FARM PRODUCED FOOD

	Personal Disposable Income	Consumer Expenditure	Marketing Bill	Farm Value
		— million dollars —		
1966	39901	6169	3656	2513
1967	43123	6370	3739	2581
1968	46820	6643	4013	2630
1969	50911	6961	4168	2793
1970	53986	7841	5026	2815
1971	59401	8531	5634	2897
1972	66740	9528	6149	3380
1973	75977	11319	7130	4189
PERCENTAGE OF DISPOSABLE INCOME				
1966		15.46	9.16	6.30
1967		14.77	8.67	5.99
1968		14.19	8.57	5.62
1969		13.67	8.19	5.49
1970		14.52	9.31	5.21
1971		14.36	9.48	4.88
1972		14.28	9.21	5.06
1973		14.90	9.38	5.51

Source: Statistics Canada and Economics Branch, Agriculture Canada.


CANADIAN FARM FOODS CONSUMED DOMESTICALLY
BILLION DOLLARS
BILLION DOLLARS
CONSUMER EXPENDITURES
(Retail Value)
MARKETING BILL
FARM VALUE
0
2
4
6
8
10
12
14
1966
1967
1968
1969
1970
1971
1972
1973
1974
Figure 1

from $2.5 billion to $4.1 billion. The increase from 1972 to 1973 was 23.9 percent, or $809 million.

The greater percentage increase in consumer expenditure (83.4 percent) compared to the percentage increase for farm value (66.7 percent) suggests that in the period from 1966 to 1973 Canadians were demanding, and willing to pay for the extra convenience of marketing services such as processing, packaging, supermarket costs, etc. This is reflected in the figures for the marketing bill, which increased by 95 percent in this period from $3.6 billion to $7.1 billion. Despite current consumer hesitancy over food prices, it is realistic to predict that the size of the marketing bill will continue to increase at an accelerating rate. Several factors will allow this trend to continue including increasing urbanization, to growing number of women entering the paid labor force (housewives' work is recognized as unpaid labor by economists but its value is excluded from the GNP because of the difficulty of accurate measurement) and the greater degree of processing and packaging necessary as consumers demand seasonal foods throughout the year.

The Marketing Bill for Product Groups

As noted in tables 2 to 6, there is considerable variation between the farm shares of selected product groups. For example, the farm share of the consumer food dollar for fresh eggs ranges between 63.4 percent and 70.8 percent while the farm share for vegetables ranges between 23.9 percent and 40.9 percent. One cannot assume from this data alone that poultry farmers are more wealthy, or are earning greater incomes than vegetable farmers. To some extent the farm share reflects the degree of processing necessary before a farm product is suitable for resale. An egg destined for the fresh market requires no processing, and the marketing bill represents only washing, grading, packaging, transportation and retailing costs. On the other hand, tomatoes destined for tomato paste undergo extensive changes in both content and form. In this case the marketing bill would include the cost of every process necessary for the metamorphosis in addition to transportation and retailing costs.

TABLE 2. FRESH EGGS

Year	Gross Farm Value	Aggregate Retail Value	Farm Share
	— thousand dollars —		
1966	158697	233226	68%
1967	142790	207339	68.9%
1968	153980	222416	69.2%
1969	179547	253454	70.8%
1970	152057	234958	64.7%
1971	134123	211518	63.4%
1972	147816	223599	66.1%
1973	218654	310569	70.4%

Excludes breaking eggs.

Source: Economics Branch, Agriculture Canada.

TABLE 3. FOWL & CHICKEN

Year	Gross Farm Value	Aggregate Retail Value	Farm Share
	— thousand dollars —		
1966	153989	247163	62.3%
1967	151181	251680	60.0%
1968	156964	258069	60.8%
1969	176339	294266	59.9%
1970	178867	308552	57.9%
1971	184604	313884	58.8%
1972	216177	382103	56.5%
1973	317507	528996	60.0%

Source: Economics Branch, Agriculture Canada.

TABLE 4. TURKEYS

Year	Gross Farm Value	Aggregate Retail Value	Farm Share
	— thousand dollars —		
1966	70949	101880	69.6%
1967	68248	96973	70.3%
1968	67281	95270	70.6%
1969	71464	109390	65.3%
1970	68976	109785	62.8%
1971	69686	110594	63.0%
1972	78426	120089	62.3%
1973	103327	158449	65.2%

Source: Economics Branch, Agriculture Canada.

TABLE 5. FRUITS*

Year	Gross Farm Value	Aggregate Retail Value	Farm Share
	— thousand dollars —		
1966	58885	216672	27.2%
1967	70565	220784	31.9%
1968	67398	217589	30.9%
1969	65616	192464	34.1%
1970	64352	206190	31.2%
1971	66475	239970	27.7%
1972	79322	221057	35.8%
1973	104745	258255	40.5%

* Fresh and processed.

Source: Economics Branch, Agriculture Canada.

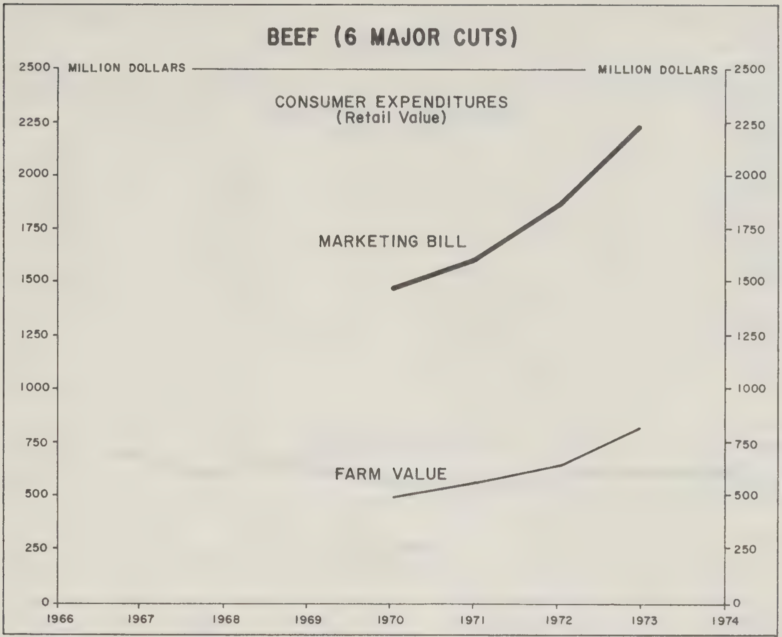


Figure 2

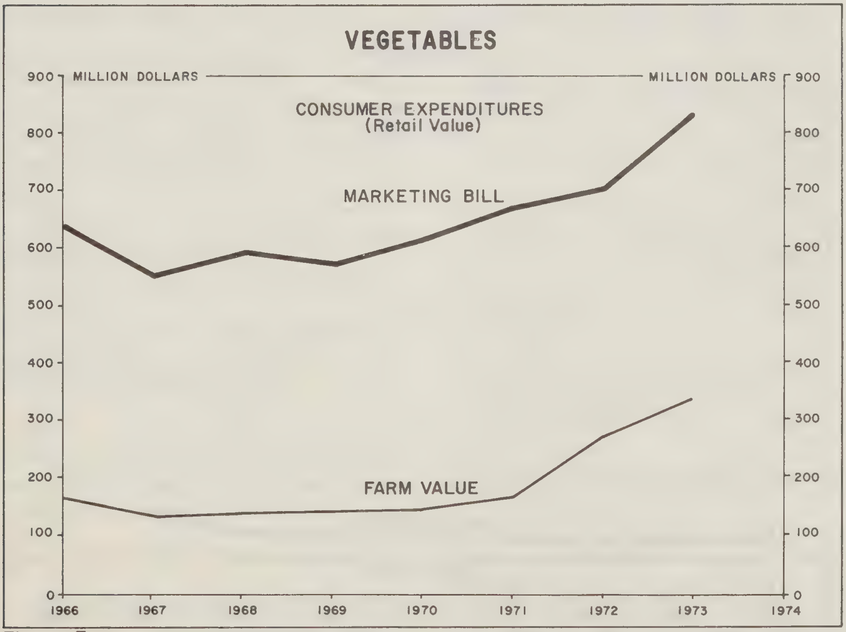


Figure 3

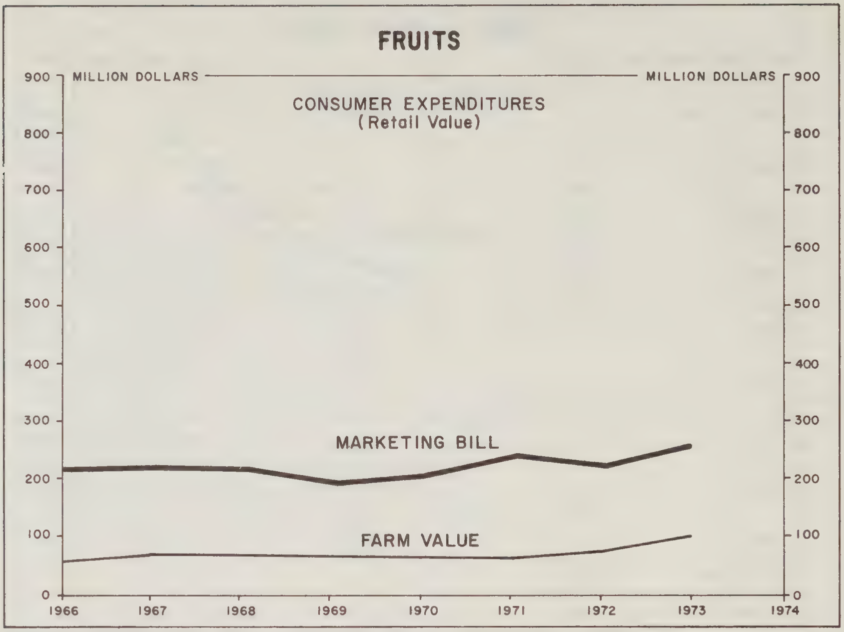


Figure 4

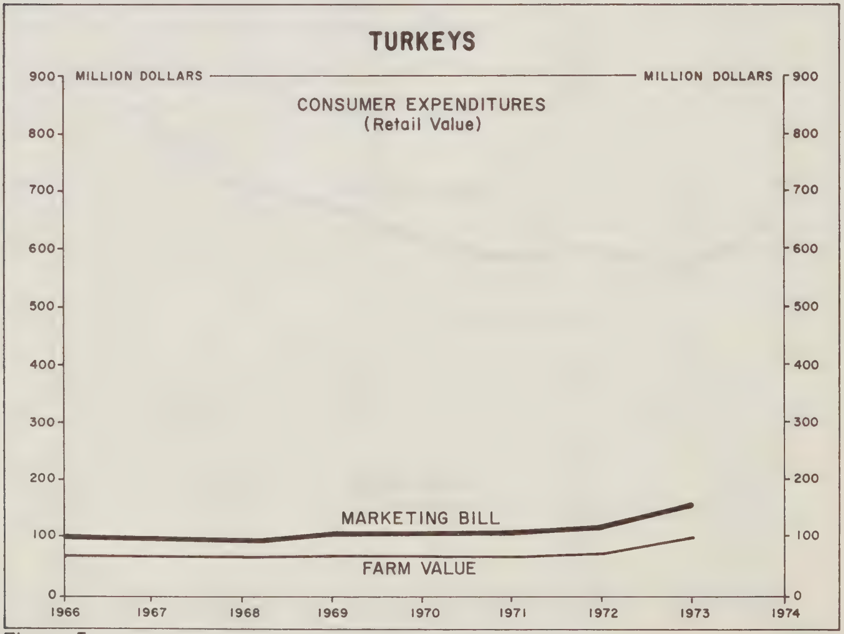


Figure 5

TABLE 6. VEGETABLES*

Year	Gross Farm Value	Aggregate Retail Value	Farm Share
	— thousand dollars —		
1966	167530	637875	26.2%
1967	133552	552342	24.2%
1968	142413	594789	23.9%
1969	144168	572200	25.2%
1970	147620	615033	24.0%
1971	170703	670295	25.4%
1972	274293	703127	39.0%
1973	340567	831481	40.9%

* Fresh and processed.

Source: Economics Branch, Agriculture Canada.

In the product groups fruits and vegetables, there was a noticeable increase in the farm share in 1972 and 1973. With fruits this was principally due to the increased average farm value of apples in those years, from 3.1 cents a pound to 7.4 cents. Apples constituted 53.16 percent of the total gross farm value of fruits in 1973. With vegetables the increase was partly due to the significant increase in the average farm price of potatoes in 1972 and 1973, from $1.99 a cwt. to $5.00. Potatoes accounted for 60.59 percent of the total gross farm value of vegetables in 1973.

ANALYSIS OF METHODOLOGY

Food

The pertinent figures shown in tables 2 to 7 are Gross Farm Value, Aggregate Retail Value, and Farm Share. The methodology used in arriving at these values is as follows:

Gross Farm Value: Farm equivalent x waste factor = farm equivalent supply.

Farm equivalent supply x average farm price = Gross Farm Value.

Domestic supply = (Per capita consumption x population) – imports.*

**Statistics Canada Publication #3226*

It is necessary to take into account a waste factor that allows for losses between the farm gate and the processor, or the farm gate and the wholesaler, in the case of fresh commodities.

Aggregate Retail Value

This is the most difficult parameter to accurately calculate since it takes into account the retail price of food commodities in all their marketed forms i.e. fresh, canned, frozen, dried, etc.

In order to achieve the desired result, each commodity is broken down into the percentages consumed in each of its fresh or processed forms. For example of all tomato products consumed in 1966, 37 percent were fresh, 18 percent were canned, 26 percent were juice, 7 percent were paste and 12 percent were ketchup. Such percentages are calculated from total domestic supply of all food commodities that have been disaggregated in this analysis. Each figure derived for processed food was then divided by a conversion factor. This takes into account processing shrinkage and waste. For example, the processing shrinkage for tomato paste is 5.27, meaning that 5.27 pounds of fresh tomatoes are required to manufacture one pound of tomato paste.

Conversion factors used are those of the U.S.D.A. since it is assumed that Canadian processing plants use the same, or similar processing machinery as do their U.S. counterparts, and therefore achieve the same processing efficiencies.

The resultant 'process equivalent' figure from the above calculation is multiplied by the retail price of the commodity in question. In order to achieve as much accuracy as possible with regard to prices, several sources are used. These are: The Ambler Pricing Service (Toronto only), calculated average prices – 12 major cities (Statistics Canada), Family Food Expenditure in Canada (Statistics Canada Catalogue #62531). The prices calculated for each commodity are Canada-wide averages, although it was found that in almost every commodity the standard deviation around the mean (12 major cities) was small.

The Consumer Price Index (110 commodities) is used to calculate price changes through the time period in question, together with periodic spot checks with actual supermarket prices from time to time to ensure accuracy.

Farm Share

The farm share is the Gross Farm Value expressed as a percentage of retail value.

INTERPRETING THE MARGIN

The purpose here is to help clear the air regarding the many inferences made by consumers, producers, and farmers alike, based on their observations of the total food bill. For example, when there is a noticeable increase in the marketing margin of the food bill, there is a tendency to charge that the distributing sector of the food chain is making excessive profits.

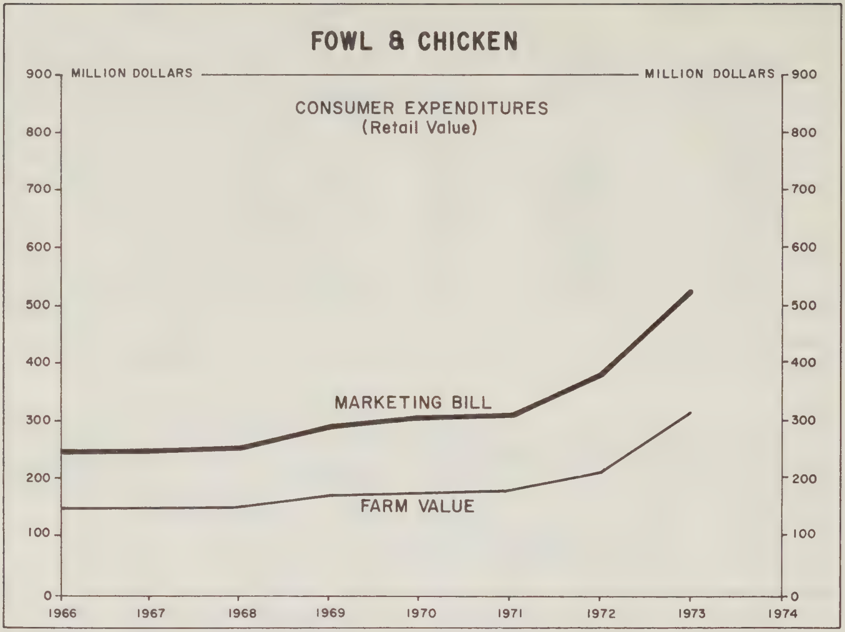


Figure 6

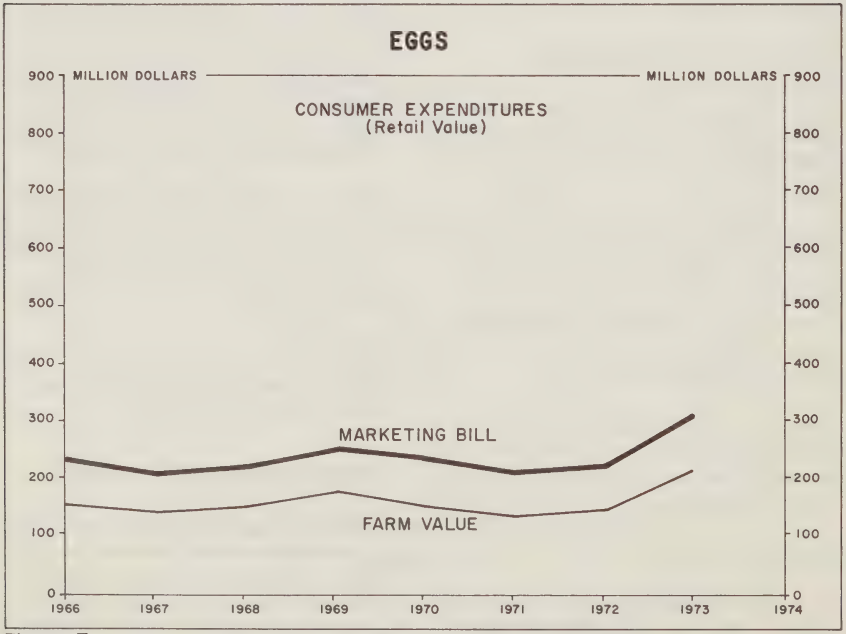


Figure 7

TABLE 7. BEEF (6 MAJOR CUTS)*

Year	Gross Farm Value	Aggregate Retail Value	Farm Share
	— thousand dollars —		
1970	502492	1,475,057	34.1%
1971	571231	1,609,835	35.5%
1972	650935	1,862,397	34.9%
1973	833268	2,246,202	37.0%

*Excludes by product value.

Source: Economics Branch, Agriculture Canada.

NOTE: Disaggregations of individual commodities within each of the above major groups are available on request. i.e. cabbage, celery, peaches, sirloin steak, etc.

While there is some evidence of a positive relationship between changes in the marketing margin and profits reported by marketing firms, there is no direct link between the two. The following statements illustrate this point.

- A rise in the farm-retail marketing margin does not necessarily imply that marketing firm profits have increased.
- A reduction in marketing margins does not necessarily imply that marketing firm profits have decreased.
- A period where margins have remained unchanged does not necessarily imply that profits have remained unchanged.

The reason that these inferences cannot be drawn directly is that the farm-retail spread is a measure of differences in prices only at two levels of the marketing system while profit is a measure of the differences between revenue outlays by firms providing selected marketing services. This can be explained more fully as follows:

Let M = farm-retail margin
V = volume of product marketed
p_i = price of input i used by marketing firms
q_i = quantity of input i used by marketing firms

Then MV = gross revenue of marketing firms
$\Sigma p_i q_i$ = gross outlays of marketing firms

Profit (P) is the difference between the two.

It is generally true that:

$$\begin{bmatrix}\text{Change in}\\ \text{Profits}\end{bmatrix} = \begin{bmatrix}\text{Change in}\\ \text{Gross Revenue}\end{bmatrix} - \begin{bmatrix}\text{Change in}\\ \text{Gross Outlays}\end{bmatrix}$$

or more formally:

$$\Delta P = \Delta MV - \Delta \Sigma p_i q_i \text{ where } \Delta = \text{change}$$

If all other variables remain unchanged, we may make the following inferences:

Profits will increase when	Profits will decrease when
1. M increases	1. M decreases
2. V increases	2. V decreases
3. p_i decreases	3. p_i increases
4. q_i decreases	4. q_i increases

It will be noted therefore that M (marketing margin) is only one of four variables that determine profits of marketing firms. Profits will change in the same direction as M only when offsetting changes in V, p_i or q_i do not occur. Further, there is the possibility that wholesale and retail margins may move in opposite directions, having opposite effects on wholesale and retail profits, which may leave the profits of the vertically integrated system unchanged. Similar arguments can be put forward for the farmer. For example, an increase in the farm share of the marketing bill does not necessarily mean that there has been an increase in farm profits. The farmer's p_i and q_i could have increased to such an extent that the $p_i q_i$ outweighs any extra profit that may have been realized by the increased farm share of the total marketing bill. In recent months there have been significant increases in the price of farm inputs such as gasoline, machinery, fertilizer, labor, etc., which would lend credence to this argument. Consequently, watertight arguments and sometimes even general inferences, regarding either farmers' or marketers' profitability, cannot be drawn from observed changes in the food marketing bill, simply because there are so many other factors affecting profitability.

CONCLUSIONS

The size of the marketing bill or the farmer's share of the consumer food dollar cannot alone answer questions regarding efficiency, profitability or any other criteria regarding performance. The marketing bill is but one of a number of factors that must be taken into account in order to arrive at such conclusions. These other factors include price changes of inputs, quantity changes of inputs, changes in volume of product marketed, and any combination of these. Yet too often one sees conclusions drawn from an observed increase in either the farmer's share or the marketer's share of the consumer food dollar, without any regard for any other determinants of cost, efficiency of profitability.

TABLE 8. EXPENDITURES FOR FOOD AS A PERCENTAGE OF DISPOSABLE INCOME, SELECTED COUNTRIES.*

Country	1963	1972
Canada	20.5	17.5
United States	18.9	15.4
Austria	37.8	28.6
Belgium	29.9	24.1
Luxembourg	32.2	25.2
Finland	36.5	33.6
France	34.9	23.4
Germany	30.4	24.2
Greece	42.5	32.6
Ireland	46.5	37.8
Italy	39.9	33.6
Netherlands	26.2	22.0
Sweden	28.8	27.1
United Kingdom	34.1	29.8
Japan	32.3	26.0

Source: OECD, Wroking paper No. 1 of the Committee for Agriculture.

* 1972 is the latest official information available.

For Canada and the U.S., disposable income = personal expenditure on consumer goods and services + current transfers to corporations + current transfers to non residents + personal savings. For all other countries disposable income = final private consumption + household savings.

In order to lend some perspective to the average Canadian's expenditure on food in relation to his disposable income, it is pertinent to list comparative data for a number of other countries (Table 8).

REFERENCES

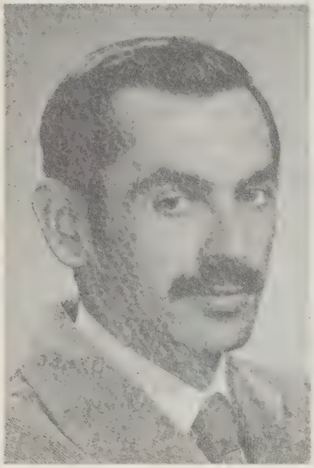
1. Marketing Spreads for Food Products, USDA 1975.

2. The Bill for Marketing Farm Food Products. Economic Research Service, USDA, August 1974.

3. Handbook of Food Expenditures, Prices and Consumption. D. Champagne and Z.A. Hassan, Economics Branch, Agriculture Canada. Publication No. 75/6, May 1975.

4. Royal Commission on Price Spreads of Food Products, September 1959. Vol. 2.

THE ECONOMICS OF WASTE HEAT UTILIZATION FOR CONTROLLED ENVIRONMENT PRODUCTION OF AGRICULTURAL PRODUCTS



As interest and experimental work in the use of "low grade heat" increases, an evaluation of the factors and problems involved becomes necessary. This paper describes some of the major characteristics of the industry, illustrates a number of problems confronting the industry, reviews related research and comments on the direction of future research.

*R.W. Anderson and N.J. Teeter**

INTRODUCTION

No valid conclusion can be made about the ultimate use of low grade heat for agricultural production because of insufficient research[1]. However, as interest and experimental work in this area increase, the factors involved and problems that will have to be overcome if the use of low grade heat[2] is to be economically feasible need to be evaluated. This paper outlines the major problems in the use of low grade heat both as a replacement for existing fuels and as something completely new for agricultural production and briefly reports the experimental results to date. This will be done by examining the major characteristics of the greenhouse industry: its location relative to competition; fuel costs; capital investment; and competition for potential markets. Finally, the paper examines research on the use of low grade heat in greenhouse production.

INDUSTRY CHARACTERISTICS

The type of product that might be produced will affect its economic feasibility. Is the product a luxury item or a staple? The state of the economy will also be a factor in product determination. Consumers in the low and middle income brackets, feeling the effects of inflation and high unemployment may look seriously at their expenditures on luxury items and alter consumption patterns.

Production costs are a major concern. The escalating cost of factor inputs such as labor, fertilizer, fuel and other oil-based products, and the cost of financing must be considered. In addition to production costs, the complexities and high costs of marketing dictate that the crop produced must be both high in volume and high in value. In the case of vegetables, tomatoes and cucumbers usually fall into this category.

Information on the potential size and characteristics of the market is necessary. First, the volume of product

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[1] Modern industrial technology has created situations (steam-electric plants, nuclear reactors) where substantial amounts of waste heat are generated. Interest in using this heat for producing agricultural products in Canada and Northern Europe has resulted in limited research on the topic.

[2] Low grade heat as discussed in this paper is heat at a temperature sufficiently low to make it of little value in most industrial processes but possibly warm enough to stimulate many life processes.

TABLE 1. FRESH CUCUMBERS: SUPPLY AND DISPOSITION, CANADA, 1969-1973

	1969	1970	1971	1972	1973[a]
			– 000 lbs. –		
Cucumbers					
Imports (Greenhouse Seasons)[b]	18,330	23,622	18,152,	23,898	23,412
Exports	–	–	–	–	–
Domestic Greenhouse	22,469	16,648	18,865	19,252	20,352
Supply[c] (Greenhouse Seasons)	40,799	40,270	37,017	43,150	43,764
Domestic Greenhouse Production as a Percent of Supply (Greenhouse Seasons)	55.1	41.3	51.0	44.6	46.5
Annual Fresh Exports[b]	1,435	726	1,499	833	531
Annual Fresh Supply[b,c]	85,462	89,661	76,142	66,230	76,026
Domestic Greenhouse Production as a Percent of Annual Fresh Supply	26.3	18.6	24.8	29.1	26.8

[a]Preliminary Data
[b]Includes field
[c]Exports are subtracted

Source: Statistics Canada, Greenhouse Industry 22-202, Agriculture Canada data

consumed, both annually and seasonally, provides a benchmark for economic consideration. Domestic greenhouse cucumbers, for example, account for only 27 percent of the annual fresh supply but during the actual greenhouse seasons, March to June, and October to December, they account for 47 percent of the fresh supply (Table 1). After the volume consumed is determined, the alternative sources of supply, the percentage of the market supplied by each source, and the price structure of the product must be established in order to obtain a picture of the market share each source controls during various times of the year and the competition each offers. It will also give some indication of whether the market is expanding or contracting, the relationship between price and demand and, possibly, price thresholds.

With most horticultural crops, daily changes in supply and the limited storage life of the product result in a highly variable market price. Historically, price variations were considered to be a function of supply, with demand assumed to be fairly constant. More recently, however, the price and supply instability inherent in the industry has become even more pronounced partly as a result of rapidly rising production costs but also a result of the increasing importance of field-produced imports. At the consumer level, demand for horticultural (especially greenhouse) products may also be changing.

In terms of the demand for greenhouse tomatoes and cucumbers, it is expected that increases in income and population would have a positive influence on the volume demanded. If greenhouse tomatoes and cucumbers are 'normal' goods (i.e. as their incomes rise consumers buy more of the good) increased sales could be expected as income improves. While no estimate of the income elasticity for greenhouse vegetables is available, the high prices of these products relative to other vegetables suggests that these are luxury products and thus very responsive to increases in income. The fact that total per capita fresh tomato consumption (both field and greenhouse) has a positive income elasticity of .29, as reported by Hassan and Lu, further indicates a positive income relationship for tomatoes[3]. Although per capita consumption of all tomatoes (fresh) has remained relatively constant in recent years (approximately 11.5 to 12 lbs.), per capita consumption of domestically-produced greenhouse tomatoes has not. With production of domestic greenhouse tomatoes remaining constant in recent years, per capita consumption has actually decreased. This implies increased competition from field or imported greenhouse tomatoes. Thus, while the demand for all tomatoes does respond to increases in income and population, the

[3]Hassan, Zuhair A., W.F. Lu, Food Consumption Patterns in Canada, Economics Branch, Agriculture Canada. Publ. No. 74/8, 1974.

greenhouse product, contrary to expectations, does not appear to have shared this response.

A reason for the apparent lack of response of greenhouse vegetables to increases in income and population may be the existing price differentials. Greenhouse cucumbers and tomatoes have traditionally received a higher price than field produce. This difference in price may have resulted from a real difference in quality or a perceived difference resulting from promotion programs. Regardless of how the difference is established, consumers have believed a difference existed through their willingness to pay higher prices for greenhouse products. More recently, improved quality in or increased promotion of the field product may be resulting in a reassessment of the price differential by consumers. If this is the situation, products such as tomatoes and cucumbers produced in greenhouses or under other controlled environment conditions can expect a lower price differential and thus lower returns. When estimating future sales and returns, consideration of the changes in price differentials and the seemingly low response to income increases will be essential for realistic projections.

Location

From the transportation and marketing point of view, locating a greenhouse operation close to Canadian markets eliminates some of the transportation costs encountered by producers in Mexico, Florida, etc., and provides a certain price advantage. Research in the U.S., where greenhouse production like that in Canada has been relatively small in comparison to total production of horticultural crops, has concluded that the comparative advantage of production in more moderate climates has, to date, outweighed any savings in transportation costs (1). This research by Professor M.E. Cravens of Ohio State University comparing the U.S. greenhouse industry to distant, climatically-favored field producers, found that continued success in the U.S. greenhouse industry will depend on sales and merchandising policies that exploit the quality differences of the greenhouse product rather than on competing on a price per pound basis with distant field production. Although the competitive price disadvantage of greenhouse producers is intensified by the current energy crisis, it was found that, even with the fuel prices of the 1960s, greenhouse operations were at a competitive disadvantage. Moreover, recent increases in Canadian imports of winter vegetables from Mexico implies a competitive advantage to Mexican field production areas over U.S. areas as well as increased competition for domestic production. While it is hypothesized that the proportion of the population that can afford the high-priced greenhouse produce will increase as people become more affluent, the quality of the lower-priced vine ripe field tomato has improved and is expected to compete even more strongly for an increased share of the market.

Most of Canada's greenhouse industry is located near major population centres and thus is in a position to benefit from any savings in transportation costs. Sources of waste heat, however, are less centrally located with respect to major markets. Some of the limited transportation benefits will be lost when production is located near the waste heat sources. Although some discussion of the possibility of moving waste heat has taken place, it appears unlikely that low grade waste heat will be transported in the foreseeable future.

Industry Fuel Costs

There are an estimated 502 acres under plastic and glass in Canada devoted to vegetable production, with an approximate annual value of production of $14 million. Ontario is the major producing area in Canada, accounting for about 82 percent of the total Canadian greenhouse production with British Columbia a distant second at eight percent. At present there are two major greenhouse vegetables – tomatoes and cucumbers (regular and long seedless). Two crops per year are usually grown, spring (March to June) and fall (October to December), with spring production significantly larger than fall. Ontario produces over 80 percent of the annual greenhouse tomato crop and over 75 percent of the annual greenhouse cucumber crop in Canada (2).

Heating is a major cost in the greenhouse industry and accounted for approximately 17 percent of total costs in 1973 (Table 2.) However, the prices of fuels used by the greenhouse industry have increased more rapidly than the average price of all fuels, consequently heating costs are expected to account for approximately 37 percent of total costs in 1975.

Three types of fuel are commonly used for heating; natural gas, No. 2 light oil and Bunker C oil. Industry sources report that all Ontario growers using natural gas have a second boiler that uses oil. This makes a transfer from gas to oil relatively easy if price or supply indicates a switch would be beneficial. In Ontario, approximately half of the producers use natural gas, one quarter use Bunker C oil and the remaining quarter use No. 2 light oil.

In British Columbia, most greenhouse producers in the Fraser Valley use natural gas, while on Vancouver Island

TABLE 2. GREENHOUSE VEGETABLE PRODUCTION COSTS AS A PERCENT OF TOTAL PRODUCTION COSTS 1973-1975[a]

Item	1973	1974	1975
		Percent of total cost	
labor costs, hired	6.12	6.22	6.06
production supplies	4.89	5.44	6.98
heating	16.75	29.33	36.80
truck and auto	1.14	1.09	1.05
utilities	1.72	1.47	1.55
legal, accounting	.37	.30	0.29
interest, operating	1.26	1.30	1.34
bees	.08	.06	.09
other costs	.38	.33	.37
marketing charges	13.73	13.10	14.88
taxes	1.97	1.73	1.65
insurance	1.67	1.47	1.61
Maintenance for			
buildings	2.26	2.28	2.13
machines	1.93	1.84	1.94
costs (before interest, depreciation and family labor)	54.29	61.92	57.03
interest on investment	15.06	11.97	12.01
depreciation	9.71	7.72	10.20
cost (before allowance for operator & family labor)	79.06	81.61	79.25
operator labor	13.04	10.37	12.92
family labor	7.90	8.02	7.82
TOTAL COSTS PER GREENHOUSE ACRE	100.00	100.00	100.00

[a]Update Procedures — Used the percent change in Farm Input Price Indexes on an annual basis 1973, 1974, and first quarter 1975 for eastern Canada, Statistics Canada, Catalogue 62-004. The only exception is heating which is not updated by this index but reflects the recent percentage increases in price for Bunker C, #2 light oil and natural gas.

Source: G.A. Fisher, Greenhouse Vegetable Production Costs and Returns in Ontario, 1973. Economics Branch, Ontario Ministry of Agriculture and Food.

where natural gas is not available, Bunker C oil and No. 2 light oil are of equal importance. No cost estimates were available for fuel in B.C., but increases are expected and the industry there although in a more temperate climate, is likely to encounter fuel supply and price conditions similar to those in Ontario.

Impact of Increased Fuel Costs

Fuel cost increases already announced for the fall of 1975 will increase the total cost per greenhouse acre by the amounts shown in Table 3.

TABLE 3. FUEL COSTS INCREASES IN ONTARIO, FALL 1975

Type of fuel	Volume used/acre	Price increase	Total cost increase/acre
Natural gas	14 million cu. ft.	$0.43/1000 cu. ft.	$6,020.00
#2 light oil	80,000 gallons	$ .04/gallon	$4,000.00
Bunker C oil	70,000 gallons	$ .05/gallon	$3,500.00

In terms of total costs, and depending upon building and equipment efficiency, natural gas is still competitive even at higher prices, as illustrated in Table 4.

TABLE 4. TOTAL FUEL COST PER GREENHOUSE ACRE (ONTARIO USING ANNOUNCED FUEL COSTS FOR OCTOBER & NOVEMBER 1975)

Natural Gas (14 million cu. ft.)	
Interrupted Service	$20,679.00
Uninterrupted Service	$26,180.00
No. 2 light oil	$29,600.00
Bunker C oil	$23,100.00

Assuming an average yield of 153,323 pounds per acre from the combined fall and spring tomato crops, the fuel cost increases using present production methods alone will amount to the following increases in costs per unit (pound) of product.

TABLE 5. INCREASE IN COST RESULTING FROM FUEL COSTS INCREASES THAT BECOME EFFECTIVE IN THE FALL OF 1975 (CENTS PER POUND FOR TOMATOES, ONTARIO)

Natural gas	14 million cu. ft.	3.93 ¢/lb
No. 2 light oil		2.61 ¢/lb
Bunker C oil		2.28 ¢/lb

Thus, in order for growers to realize the same net return as before, corresponding product price increases will be required to maintain domestic supply (assuming no changes in efficiency of fuel use and no adjustment in factor proportions).

Major Investment and Operating Costs

Many greenhouse growers in southern Ontario are experiencing considerable difficulty keeping their operations viable (Table 6.) Many rely on family labor and on the fact that their capital investment is already paid off. Competition from imports means that costs cannot always be passed on to consumers. This results in lower returns or losses to growers. Product quality also affects returns to growers and in some years is beyond grower control. In view of these conditions and the cost of new investment, it is not surprising that industry expansion is almost nil.

A look at the costs of building and operating a new greenhouse facility will provide some insight into the financing problems of the industry. For discussion purposes, assume a capital investment of $1 million. Recent estimates (3) place the capital investment for construction at $7 per sq. ft. This includes all capital equipment such as heaters, fans, building materials etc. At $7 per sq. ft., $1 million would finance construction of 142,857 sq. ft. or 3.28 acres of glass greenhouse. From 5,000 to 6,000 man-hours of labor per acre per year are required for a spring and fall greenhouse operation of this size. This means 16,400 hours for 3.28 acres which, at the current Ontario minimum wage of $2.40 per hour, means a minimum labor cost of $39,000 per year. Benefit costs such as unemployment insurance and workmen's compensation would be additional. This

TABLE 6. GREENHOUSE VEGETABLE COSTS AND RETURNS IN ONTARIO, 1973

	Essex County	Niagara-Welland	Bradford
		dollars	
Per greenhouse operation			
Tomatoes, spring	22,713	22,173	24,013
Tomatoes, fall	9,480	8,325	10,597
Cucumbers, regular	20,418	...	...
Other	2,331	...	75
Total gross returns	54,942	30,498	34,685
Total costs	62,435	42,193	41,444
Net returns to risk and management	−7,493	−11,695	−6,759
Per greenhouse acre			
Tomatoes, spring	19,722	25,664	35,733
Tomatoes, fall	8,231	9,635	15,769
Cucumbers, regular	17,729	...	...
Other	2,024	...	112
Total gross returns	47,706	35,299	51,614
Total costs	54,213	48,834	61,672
Net returns to risk and management	−6,507	−13,535	−10,058
Per square foot of greenhouse area			
Tomatoes, spring	.45	.59	.82
Tomatoes, fall	.19	.22	.36
Cucumbers, regular	.41	...	...
Other	.05	...	.01
Total gross returns	1.10	.31	1.19
Total costs	1.25	1.12	1.42
Net returns to risk and management	−.15	−.31	−.23

Source: G.A. Fisher, Greenhouse Vegetable Production Costs and Returns in Ontario, 1973. Economics Branch, Ontario Ministry of Agriculture and Food.

is a minimum labor cost as the cost of management and other skilled personnel has not been calculated. Fuel costs, at present prices, would be an estimated $25,000 per acre per year (compared to $6,200 in the late 1960s) for a total annual cost of $82,000.[4] Assuming that greenhouse growers in Ontario could borrow money at nine percent, the annual interest on $1 million would be $90,000. Total labor fuel and interest cost would be $211,000.

On the production side, it is possible to plant a maximum of 35,714 plants (four plants per sq. ft.) in 3.28 acres of greenhouse. This number excludes space for walkways and equipment and consequently the actual number of plants will be lower. Assuming the operation is managed by an experienced grower, then 10 pounds of tomatoes per plant can be expected from the spring crop and five pounds per plant from the fall crop for a total annual production of 535,710 pounds. Not all tomatoes will be grade A or of marketable quality.

Assuming that most of the production is marketable and using a price of 43¢/lb.[5], total annual revenue will be approximately $230,000. After subtracting $211,000 for labor, interest and fuel, one is left with approximately $19,000 before such other costs as licenses and fees, land acquisition, property taxes, vehicles, transportation, insurance, depreciation, etc., are even considered. In some years, these other costs have, according to industry reports, resulted in a net loss for growers.

Competition

About 80 percent of the Ontario tomato market is supplied by field tomatoes from Mexico and the United States[6]. Industry and government sources indicate that during the actual greenhouse production seasons about 65-70 percent of the Ontario and Quebec markets are supplied by domestic greenhouse tomatoes while the rest of the country relies mainly on imports. More specifically, imports into Ontario from Mexico are important only in relation to the spring greenhouse crop and are the principal source of imports during that season.

A review of the price structure in Ontario shows that during the spring greenhouse season, prices paid to Ontario greenhouse producers are generally more than double those received by Mexican growers. Wholesale prices, which are inclusive of packaging, transportation and tariff costs, are substantially lower for Mexican field tomatoes coming into Canada than for Ontario greenhouse tomatoes. Such a price structure indicates that domestic greenhouse tomatoes continue to receive a price differential. In general, the price for domestic greenhouse tomatoes does respond to changes in import prices with a fairly constant (possibly declining) margin separating the two. In other words, consumers will pay a higher price for the domestic fresh product.

Research

Cost data for existing greenhouse operations specify the four major greenhouse expenses as fuel, labor, marketing charges and interest. These are the areas where improved cost-reducing technology can have the greatest impact. On a world-wide basis, scientists have been conducting research directed at more efficient use of energy especially for heating purposes. The Danes (4) are testing control instruments for use within a glass dome mounted on top of the greenhouse, the objective being a completely regulated control system based on solar energy. The equipment in the dome will trigger automatic ventilation, insulation, shading, humidity control, irrigation and blackout. Still in the experimental stages, this system is predicted to bring about a 10-percent saving in total fuel costs and a 10-30 percent increase in production.

Until recently, the use of solar power for the generation of electrical energy has not received serious consideration because of high costs. With energy costs escalating, scientists (5) and engineers are now beginning to explore the possibilities of using various forms of stored energy in a complementary process with present fossil fuel systems. Pilot testing using stored solar energy for heating and cooling has been carried out in California and New York. Systems involving dry exchange, contact exchange and other heating methods are under investigation in a number of countries[7]. The use of waste heat from steam-electric plants for greenhouse heating is being tested in Romania. Iceland has, for many years, used geothermal energy for both home and greenhouse heating, while Texas A&M University is studying combined dry and contact exchange systems. In some cases, the preliminary results have been encouraging. However,

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[4] As the cost of fuel increases growers may produce crops requiring lower temperatures and thus less fuel or make structural alterations to conserve fuel.

[5] A preliminary estimate of producer price in Ontario for the spring of 1975.

[6] Agriculture Canada, Annual Unload Report.

[7] Dry exchange – the air is heated by natural or forced convective transfer from the surface of the pipes, finned tubes or a special heat exchanger e.g., conventional greenhouse system. Contact exchange - the air contacts the heated water directly.

in most cases, the costs have not yet been fully investigated for the experimental systems.

In Canada, the concept of using waste heat from natural gas compressor stations (6) and atomic energy plants to heat greenhouses has become very popular. Although experiments have so far shown that the waste heat released is too low grade to independently heat a greenhouse, it could complement the existing facilities. In southern Ontario, this concept holds promise as the seasons are longer and the winters not as severe as in other parts of Canada. In the more northern parts of Canada, where use of this concept has also been advocated, there are a number of complications. Although there are seasons of long daylight hours there are many days with very limited hours of light. In this latter situation, auxiliary lighting would be required for the operation and the cost of this is even greater than fuel costs. A high capital investment for northern operations requires year round production; thus auxiliary lighting is a major factor. Unpublished data on a completely controlled environment indicate that when artificial lighting is used, ventilation or air conditioning to remove some of the excess heat generated (even in the coldest periods) by the artificial lighting is required.

Agriculture Canada has investigated the possibility of producing tomatoes and cucumbers commercially under a completely controlled environment in the northern parts of the Western provinces and has found that the cost of auxiliary lighting under experimental conditions plus the initial capital investment costs are too great to warrant commercial production at this time. Under completely controlled environment conditions, total capital investment would approximate $33 per sq. ft. while fixed expenses (depreciation, insurance, taxes, interest on capital investment) are estimated at $5.18 per sq. ft. and variable expenses at $5.30 per sq. ft. In comparison, total capital investment for an ordinary glass greenhouse would be $7 per sq. ft., fixed expenses $.40 per sq. ft. and variable expenses $1.36 per sq. ft. Presumably, the variable expenses of an environment using artificial lighting for only part of the year would be somewhere in between these two estimates. However, the original capital investment necessary to install equipment capable of utilizing both solar energy (light) and provide a completely controlled environment might be even greater than that to build a completely controlled environment. The possibility of converting waste heat energy into power for artificial light is one area where research could have a tremendous impact upon the industry.

Apart from light restrictions, there are biological constraints to be overcome for completely controlled environment production. The proper cultivars have not been developed yet to produce the type of plants suited to growing under completely artificial light. The tomato plants currently in use grow too high causing problems of light distribution. The upper foliage grows too close to the lamps causing burn-off while the lower foliage, shaded by leaves from above, does not receive adequate light. A low bushy plant that comes quickly to fruition and produces uniform premium quality tomatoes is needed. Many researchers have been enthusiastic about how quickly plants grow from seed in a completely controlled environment. However, it is not the plants themselves we are principally concerned with, but rather the fruit they bear. The amount of time it takes for them to come to fruition coupled with the quality of the produce and its acceptability to the consumer are the most important factors from an economic standpoint. Development of the proper type of plant will require continued research. Until more satisfactory cultivars are available, completely controlled environment operations will be limited in terms of the type of product, product yield and thus economic return.

Use of waste heat for the growth of agricultural products whether in existing greenhouse facilities or in some other form of controlled environment will require the combined efforts of research-oriented individuals from a number of scientific fields. Dr. R.W. Gillham (7) has outlined a number of areas requiring research directed toward the designing of the physical aspects of commercial operations. In his study, Dr. Gillham made recommendations concerning research on warm water supply, dry exchange systems, and contact exchanges systems. Scientists working in these areas must continually consult with management horticulturists and economists to ensure consideration of all relevant factors. Initial research need not consider all of the problems involved but when full-scale experimental greenhouse operations, as recommended by Dr. Gillham, are planned, all factors must be included. With cultivar development usually requiring extensive time and effort, it is important that botanists, geneticists and design engineers consult with one another continually on the parameters of plant varieties, and heating and lighting requirements.

The utilization of waste heat may be inevitable. However, it is important to recognize that both economic conditions and design problems have yet to be overcome. Although time may appear to be on our side, two factors suggest otherwise. First and foremost is the present economic state of the greenhouse industry. As implied throughout this paper, the future of the Canadian greenhouse tomato and cucumber industry is precarious. The second factor is the necessary "know-

how" and equipment to make full use of waste heat. An important factor to consider is that once a use is found for waste heat from energy plants it will no longer fall under the classification of "waste" or in more economic terms, it will cease to become a "free" good. This is what happened in the case of Bunker C oil. It was once merely a waste product from oil refineries but has since found a use, among others, in heating greenhouses. Its price as a result of the various uses found for it, has gone from zero some ten years ago to an anticipated $.33 per gallon in October, 1975. While waste heat in its present state is not transportable and must be used in close proximity to its origin, there exists the possibility of other industrial uses and thus the possibility of waste heat no longer being a "free" good.

CONCLUSIONS

This paper has reviewed the present situation with respect to products, markets, costs, competition and research. But, what can the industry look forward to in the way of a breakthrough? Perhaps there will be a change in the crops produced with a shift from tomatoes and cucumbers to other vegetables or flowers. Undoubtedly, the characteristics of the plant cultivars can be adapted to suit different growing environments. Continued research will result in alterations of power sources, structures and lighting methods. Possibly some change in the form in which waste heat may be stored and used can be expected. More information on the impact of location will also be forthcoming. In its present state, the outlook for the viability of the greenhouse industry is questionable. Research will be costly and many pilot experiments will not be successful. This does not mean research should stop. As new ideas surface, the necessary changes will come about to make use of by-products or waste products of other industries.

TABLE 7. ONTARIO GREENHOUSE FUEL CONSUMPTION

Fuel	Total Fuel	No. of Growers	Annual fuel use[a]
	Sq. Feet		(per acre)
Natural gas	7,225,000	122	11-18 million cu. ft.[b]
No. 2 light oil	1,010,000	38	80,000 gal.
Bunker C oil	1,000,740	32	70,000 gal.
Coal and Propane gas	43,560	4	n.a.[c]

TABLE 8. ONTARIO GREENHOUSE FUEL PRICES

Fuel	Old Price	New Price	Effective
Natural gas[d]	$1.0471/1000 cu. ft.	$1.4771/1000 cu. ft.	Nov. 1/75
(a) interrupted service	$1.0471/1000 cu. ft.	$1.4771/1000 cu. ft.	Nov. 1/75
(b) uninterrupted service	$1.4426/1000 cu. ft.	$1.87/1000 cu. ft.	Nov. 1/75
No. 2 light oil	$ .32/gal.	$ .37/gal.	Oct. 1/75

[a]Assumes 2 crops per year. Approximately 80% of this amount is used for the spring crop and 20% for the fall crop.
[b]The volume of natural gas used per acre varies directly with the size of the area under glass in the same operation.

over 3.5 acres used 11-14 million cubic feet
1-3.5 acres used 13-15 million cubic feet
less than 1 acre used 18 million cubic feet

[c]Not available.
[d]Interrupted service guarantees price only. If gas is in short supply, the grower will be cut off. Uninterrupted service guarantees both price and supply.

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THE PRAIRIE COMMUNITY SYSTEM

This paper views rural communities as systems of several trade centres (small towns, villages and hamlets) and the open country around them. This broader definition of communities is applied to an area in west central Saskatchewan.

A middle-ground approach to development combining regional and individual strategies is suggested since it has the value of accomodating the spending of funds to problems of sparse population by promoting local mini-growth centres without neglecting smaller centres.

*M.L. Meredith**

INTRODUCTION

When people talk about or study rural communities on the Prairies, they generally identify all trade centres as communities. These centres include all the small towns, villages, and even hamlets with a few stores and a population of less than 50. But one can ask whether each and every trade centre, of whatever size, actually is a full-fledged rural community. If not, what would constitute a rural community? This paper presents an alternative way of viewing rural communities, as systems of several trade centres and the open country around them.

The paper attempts to specify what the notion of a full-fledged rural community system involves and implies. Accordingly, the first two sections describe the parts that go together to form a community system and discuss the meaning of "full-fledged". These definitions are then applied to a specific area in west central Saskatchewan to give a concrete illustration of community systems.

No attempt is made to relate the concepts presented directly to rural development policies and programs. The intent in the final section is to present the initial general implications following from the notion of rural community systems. Assessment of more detailed policy implication of this alternative view of communities obviously awaits further research.

THE COMMUNITY SYSTEM

There is an emerging idea that several idea that several centres, each differing in size and in the role they serve for rural residents, go together to form a system. It is this system of places that makes a full-fledged community. Zimmerman and Moneo, in their study of the Canadian Prairie community system, postulated that a full-fledged community consists of one "farm city" (population of roughly 3,000 in 1966 with approximately 100 business units) along with three or four "home-towns" (population 500 and 20 businesses) and eight or nine "stop-off centres" (population 300 with five businesses), all contained along with the open country population within a 25- to 30- mile radius of the "farm city" (1). They stated that "the prairie community system is a totality and makes no coherent sense when dismembered" into its component parts, the individual trade centres.

A quarter century ago, A.H. Anderson (2), writing about the American prairies, observed that the role of trade

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centres appeared to be changing. He noted that villages with 500 or fewer people and a few services were neighborhood convenience centres corresponding to clusters of neighborhood businesses in residential areas of cities. Small towns with 500 to 1,000 people, he noted, were important community centres with several services, and today they could be compared to the plazas in the suburbs of cities. Following his reasoning, the larger towns of 1,000 to 3,500 population would be comparable to the central business district of a city. Hamlets with a store or two would be similar to the variety stores spread throughout cities. Just as no one would take part of a city, such as a neighborhood, and treat it as the whole city, it makes little sense, then, to take the parts of an equivalent rural settlement system and treat them as though they were the whole.

Anderson went on to suggest that in the 1950s a process of "differentiation of functions" among centres was underway. This process involved a sorting out among centres in the roles they performed in rural life such that some were to become neighborhood convenience centres, some community convenience centres, and some rural "downtowns". In effect, the rural settlement system is much like a city as a type of human settlement. The major difference is that its parts – downtown, community centres, and neighborhood centres – are dispersed over the countryside, separated by the open-country farms that must also be seen as a part of the system.

The basis cause of this sorting process is to be found in changing rural lifestyles, particularly changing shopping and community participation patterns. Following the spreading network of local good roads and the rising incidence of car ownership, rural residents were no longer as tied to one particular trade centre and locale. Thus, the range of territory over which they could move frequently and conveniently expanded. At the same time, increasing real incomes, rising expenditures on consumption goods, changing consumption patterns, and more leisure time spent outside the family and neighborhood groups underlay changes in destination, purpose and frequency of trips made by rural families.

But it is important to note that although commuting zones have expanded in recent history, they still have definite limits. This is especially true for commuting trips that occur frequently and regularly, such as going to school, visiting friends, or for taking part in recreational activities. Exactly what these time and distance limits are and how they vary with the frequency and purpose of trips is not known. The technical literature on rural commuting patterns is quite meager. They typically are restricted to shopping trips and, at that, only include a few of the various goods and services that families purchase[1]. But commuting for all purposes by all members of the family must be included if we are to understand the rural settlement system and if we are to evaluate its role in the quality of life of rural people. But, quite clearly, the less frequently a service is required the greater is the commuting limit. Further, commuting limits differ depending on the purpose of the trips even when the frequency of occurrence is the same. It is these variations in frequency and purpose that underlay the major roles of the different parts of the community system.

The commuting patterns of rural residents imply that any one full-fledged community system would generally have one rural "downtown", a few "community centres" (villages), and several "neighborhood centres" (villages or hamlets). The rural "downtown" would have an economic and administrative role since a major proportion of its services would be specialized economic and public services used by all residents in the total system at the frequency of at least once every week or two. The "downtown" would have a secondary role in providing social and recreational activities and facilities for the residents of the town itself and its immediate environs.

The "community centre" would have a major role as a social centre for its own residents and those in its immediate environs. Services would be used several times a week if not daily with a major proportion of them being, social, educational, religious, and recreational. They would also play a secondary economic role by offering less specialized and fewer retail services for their own and immediate-environ residents. The "neighborhood centres" would serve both an economic and social role by providing minimum convenience services for all residents within a radius of a few miles. It would be patronized on a day-to-day basis as the need arose.

FULL-FLEDGED COMMUNITIES

However, it is not sufficient to say that a full-fledged community is a collection of centres and the open country around and between them. Nor is it sufficient to say that the centres are linked in a system through the various commuting patterns and purposes of rural residents. The centres, varying in size, serve different roles, implying that each meets certain requi-

[1] See, for example, Stabler's study (3).

rements of its resident population. Determining the meaning of "full-fledged", then, means first describing those requirements that are relevant to communities.

One can think of community systems as market systems, if it is granted that more than consumer and producer goods and services are "traded". In this sense, communities are like collections of quasi-markets with the full complement of institutions, establishments, organizations, facilities and opportunities for social interaction considered as the supply side of community life, and the households considered collectively as the demand side. A full-fledged community ideally, then, is one that is able to satisfy almost all the relevant demands of its households. As a minimum this means communities should have "suppliers" of a sufficient array and quality of consumer services, educational institutions, churches, recreational facilities and activities, medical services, local public services, and membership opportunities in various clubs and organizations.

While this may seem obvious to community residents, researchers often over-emphasize commercial activities as community functions. The remaining functions are either ignored or taken for granted. The usual outcome of this is that rural communities are viewed as separate trade centres. An undue emphasis on only one kind of community activity, then, could mean that other equally important community "suppliers" are not considered legitimate areas of concern. And yet, rural families require more than retail stores in their communities.

To specify those household demands relevant to the rural community system means distinguishing between demands that must be satisfied locally versus those that can be conveniently satisfied outside the community system, usually in a city. The issue here is the location of a sufficient array of "suppliers" close enough to rural residents that their demands can be met at least cost, including the access cost (time and transportation expenses).

Demands that must be met locally are those that occur frequently and regularly and that one can neither do without nor postpone for any length of time. If these demands are not met by a local supplier, life in the community would be seriously wanting.

Demands that do not need to be satisfied locally (even though it might be desirable) are those that occur infrequently and irregularly and can conveniently be postponed without disrupting family life. These kinds of demands require commuting to cities a few times a year for those kinds of goods, services and activities the rural resident would not consider it a serious shortcoming if a supplier in his community were not available.

The distinction between the demands that can conveniently be met outside rural community systems and those that must be met within, raises some important issues. If it is socially desirable that all persons, urban and rural, have equal access to those elements involved in the quality of life, then rural communities must be able to satisfy relevant local demands in sufficiently comparable terms to those possible in cities. But often the problem involves satisfying local demands in areas of sparse population, such as west central Saskatchewan. This problem will be discussed in the final section following an illustration of full-fledged community systems.

ILLUSTRATION OF COMMUNITY SYSTEMS ON THE PRAIRIES

The ideas presented so far relate to the community as a provider of goods, services and social activities. These ideas suggest that a community should be considered as more than each "hometown" or settlement. This broader definition will now be applied to a specific area, namely, west central Saskatchewan.

This area is that part of Saskatchewan lying between the north and south branches of the Saskatchewan River and between the Alberta border and Saskatoon. The objective is to determine, on the basis of the data available, the number of rural community systems in the area, with its many settlements of varying size, and to define their boundaries.

This investigation looks at a potential community system from the supply side only. Investigation of the demand side would require a comprehensive study of the consumption (in its broadest sense) activities and preferences and the commuting patterns and processes of rural residents[2]. Further, no attempt is made to examine how well the systems are working.

Several large centres (Swift Current, Saskatoon, North Battleford, and Lloydminster with populations of 15,000 131,000, 13,000 and 9,000, respectively) are located on

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[2]To the author's knowledge, no such comprehensive study of demand using the survey questionnaire method, has been undertaken, although some promising work is being done by John L. Girt, University of Guelph, dealing with spatial preferences of persons for various goods and services.

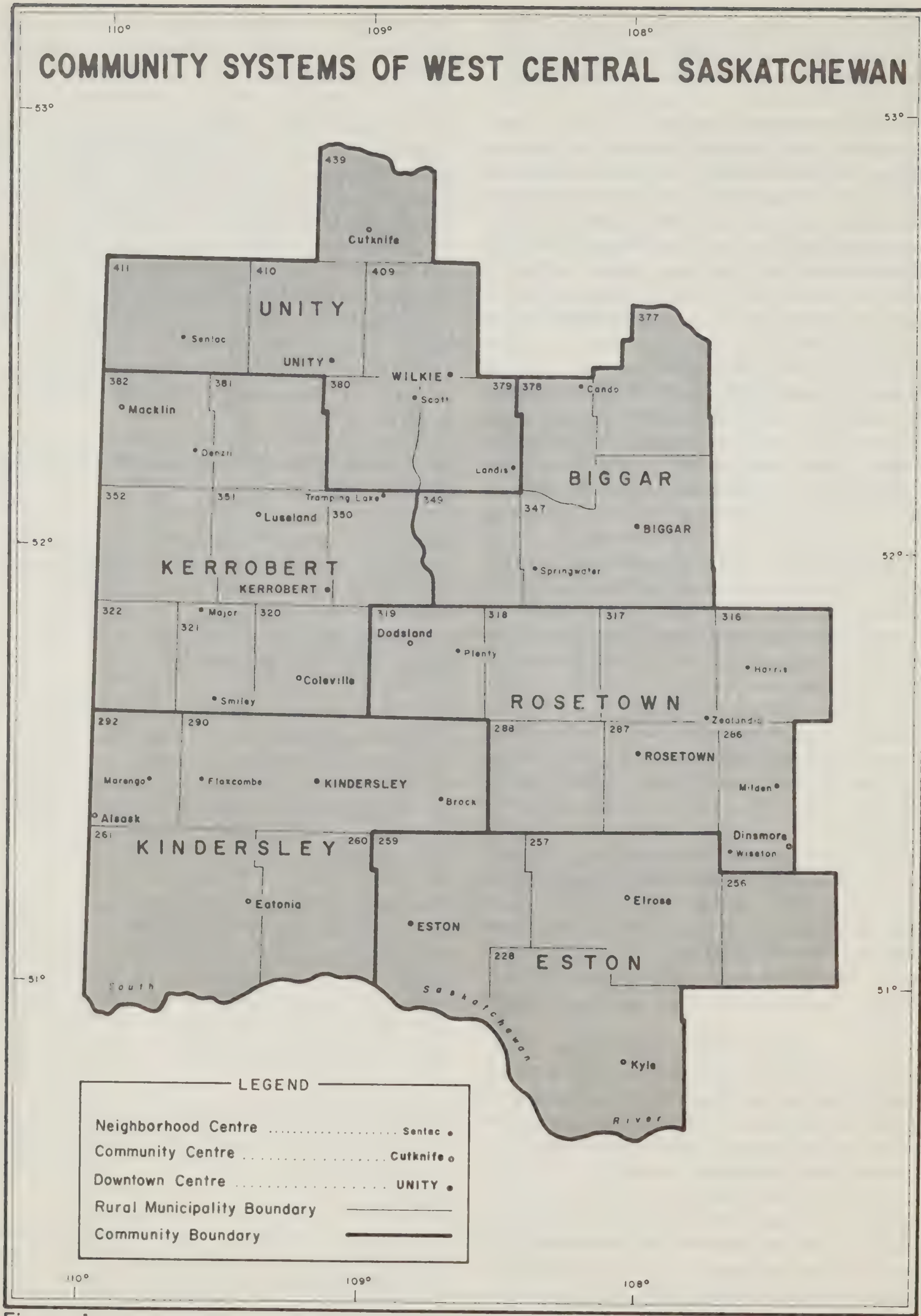
COMMUNITY SYSTEMS OF WEST CENTRAL SASKATCHEWAN
110°
109°
108°
53°
52°
51°
439
Cutknife
411
410
409
UNITY
Senlac
UNITY
WILKIE
377
382
381
380
379
378
Macklin
Scott
Cando
Denzil
Landis
BIGGAR
352
351
Tramping Lake
349
347
Luseland
350
BIGGAR
KERROBERT
Springwater
KERROBERT
322
Major
320
319
318
317
316
321
Dodsland
Plenty
Harris
Coleville
Smiley
ROSETOWN
Zealandia
292
290
288
287
286
ROSETOWN
Marengo
Flaxcombe
KINDERSLEY
Brock
Milden
Alsask
261
260
259
257
Dinsmore
KINDERSLEY
Wiseton
Eatonia
Elrose
256
ESTON
228
ESTON
South
Saskatchewan
Kyle
River
LEGEND
Neighborhood Centre .... Senlac
Community Centre .... Cutknife
Downtown Centre .... UNITY
Rural Municipality Boundary
Community Boundary

Figure 1

TABLE 1. COMPARISON OF MAJOR RURAL CENTRES IN WEST CENTRAL SASKATCHEWAN

	Kindersley	Biggar	Rosetown	Unity	Wilkie	Kerrobert	Eston
1971 Town Population	3081	2627	2614	2343	1522	1232	1190
Retail Services							
Total Establishments	106	106	129	91	63	62	59
Total Functions	45	40	45	44	41	42	41
Fee Professionals							
Total	13	7	14	9	5	6	6
Functions	6	3	6	6	4	5	3
Agribusiness Services							
Grain Elevators (Capacity 000's bu.)	6(613)	5(1000)	7(1256)	7(649)	2(466)	3(200)	5(621)
Implement Dealers	7	4	7	9	4	1	2
Bulk Oil Dealers	6	5	5	3	2	4	3
Veterinarian	1	1	0	3	0	0	0
Total Establishments	20	15	19	22	8	8	10
Total Functions	4	4	3	4	3	3	3
Social Services							
Hospital (# Beds)	1(55)	1(40)	1(40)	1(28)	1(26)	1(28)	1(24)
Schools (Enrollment-Grs. 1-12 incl.)	1(1270)	1(1132)	1(1245)	1(977)	1(692)	1(600)	1(700)
Senior Citizens Home (# Units)	1(35)	1(24)	1(50)	1(50)	0	2(56)	1(34)
Community Centre	1	1	1	1	1	1	1
Library	1	1	1	1	1	1	1
Golf Course	1	1	1	1	1	1	1
Swimming Pool	1	1	1	1	1	1	1
Total Functions	7	7	7	7	6	7	7
Religious Denominations							
Major	4	6	5	5	5	4	3
Non-Major	6	6	4	0	2	1	1
Total	10	12	9	5	7	5	4

Source: Community Data Sheet, Dept. of Industry and Commerce, Province of Saskatchewan, 1974.

the periphery of the study area (see Figure 1). Kindersley, the largest centre within the study area, has a population of 3,100. Hence, any locally generated demand that could not be satisfied in a centre equivalent to Kindersley would mean going outside the area to a city to "import" a good, service, or activity. The procedure is first to consider all seven centres[3] in the area with a population of 1,000 or more to determine whether they have a similar array of suppliers. If they have a similar array, this is assumed to indicate that each has the status of a rural "downtown" centre. After establishing the number of "downtown" centres in the area, the next step is to consider how the boundaries of influence around the centres might be drawn.

Since each institution (supplier) generally does not have identical "trade areas", communities are not in reality bounded by a single distinct line. One community system is more likely to be separated from another by a narrow zone of mutual influence. Therefore, to fix a single boundary line on a map and maintain that it is a community boundary, is necessarily arbitrary. Such a boundary line would simply indicate that there is a greater probability that the major, regular, and frequent needs of the majority of potential patrons could and usually would be satisfied within the resident community system rather than in an adjacent community system.

The supply side of the community comprises the following institutions: economic (measured by the retail and agri-business structure and fee professionals); social (measured by hospitals, schools, community centres, libraries, and recreational facilities); and religious (measured by church denominations). The economic and social services were compiled for each of the seven centres[4]. Three centres, Eston, Kerrobert and Wilkie,

[3]Kindersley, Rosetown, Eston, Biggar, Kerrobert, Wilkie, Unity.

[4]The data for this analysis were obtained from the Community Data Sheets, published by the Department of Industry and Commerce, Province of Saskatchewan, 1974.

ranging in size from 1,190 to 1,522, are substantially smaller than the other four, which range in population from 2,343 to 3,081.

Although the smaller and larger centres differ in the total number of retail establishments (Table 1), the total number of the specific types of retail units, or "functions"[5] are very similar, ranging from 40 to 45. There is a similar pattern for fee professionals (such as doctors, lawyers, accountants) in that there are more in total in the larger centres, but all seven have a similar number of types of professionals or functions (varying from three to six). Similarly, there is little difference in the number of functions in agri-business services (three or four) among the seven centres although there are nearly twice as many establishments (20) in the larger centres. The community viewed as the supplier of a full complement of institutions suggests, then, that all seven centres are equivalent in that they supply roughly the same types of private business services. The presence of a larger number of establishments in the larger centres, from the point of view of the demands of households, implies a greater degree of choice between establishments to patronize, but no greater choice in the availability of kinds of services.

All seven centres have a hospital and educational facilities for grades 1 to 12 inclusive. All centres, except Wilkie, have a senior citizens' home. All have a community centre that includes a sports complex and a meeting hall (except Eston, which uses a voluntary organization's hall). All have a golf course, swimming pools, and regional library facilities. Concerning religious services, there is a slight variation among the centres in the number of major denominations represented[6], (from three to six). However, the larger centres (except Unity) have four to six of the non-major denominations present while the smaller centres have one or two. This, again, indicates similarity among the centres in the supply of the types of social and recreational services although considerations of choice, quality, preference, etc., have been excluded. The conclusion, then, is that all seven centres have the status of a rural downtown so far as the availability of types of economic and social services is concerned.

Investigating communities according to various jurisdictional areas was undertaken to complete the determination of the likely number of community systems in the area and to derive a set of boundaries for the supply side of the community systems. The jurisdictional areas of primary relevance are those involving local community-level decision-making units: the rural municipalities and the school unit districts. The municipalities have an elected council and an administrator, operate local level public services, manage a budget, and collect local taxes. The school unit has its own superintendent, and an elected school board that exercises general fiscal autonomy, hires and maintains teachers, and decides where individuals attend schools[7]. These governmental bodies are considered to be especially indicative of a full-fledged community because they are public decision-makers operating at the local level, and can, therefore, be assumed to indicate a community system in political terms.

There are 50 rural municipalities contained in the study area. Although they undertake functions relevant to all community members and although each is self-contained and equivalent to all others, only seven contain a centre capable of satisfying all locally-generated demands i.e. a rural "downtown". On the other hand, there are six school units fully contained in the area[8]. Each has at least one full trade centre or "downtown" and contains four to eight rural municipalities within a commuting zone of 25 to 35 miles[9]. Each contains a full array of local level institutions: economic, social, and political. This suggests that the study area contains six community systems, represented by the school units, that could be considered full-fledged. They approximate a complete local-level "market" system. Within them, most of the

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[5] The term "function" as used in central place studies means a specific kind of service unit, such as grocery stores, feed dealers, churches or schools.

[6] Major denominations are: Anglican, Baptist, Lutheran, Presbyterian, Roman Catholic, and United. Examples of non-major denominations are: Free Methodist, Greek Orthodox and Ukrainian Catholic.

[7] Several smaller administrative divisions (school districts) are contained in a school unit. These smaller divisions have an elected school board that sends one member to the unit board, but functions mainly in an advisory capacity to the larger board although it may have some functions, such as school busing, delegated to it.

[8] The parts of the area that are not contained in these six school units, are beside the cities on the periphery of the area and, therefore, are assumed to be under the direct influence of these cities. An additional fully contained school unit centres on Lloydminster, and has been eliminated to control for urban influence.

[9] In work done in the U.S. (state of Iowa, with a population density several times greater than that of Saskatchewan) a commuting radius of 50 miles is assumed to encompass an entire range of economic functions. But this paper considers a smaller set of this range so the smaller commuting radius seems to be consistent with situations elsewhere.

TABLE 2. COMMUNITY SYSTEMS OF WEST CENTRAL SASKATCHEWAN

Community System	School Unit[a]	Total Population[b] of System	Downtown(s) Pop. 1000 and over (Population)	Community Centres Pop. 400-999 (Population)	Neighborhood Centres Pop. 100-399 (Population)	Open Country Population[c]	Rural Municipalities included in system
Kindersley System	34	9040	Kindersley (3081)	Alsask Eatonia (610)	Marengo (135) Flaxcombe (100) Brock (205)	4094	#290 Kindersley #292 Milton #260 Newcombe #261 Chesterfield
Eston System	33	6510	Eston (1190)	Elrose (570) Kyle (510)	None	4240	#256 King George #257 Monet #259 Snipe Lake #228 Lacadena
Rosetown System	43	9275	Rosetown (2614)	Dodsland (405) Dinsmore (425)	Plenty (105) Harris (255) Zealandia (155) Milden (235) Wiseton (130)	4801	#286 Milden #287 St. Andrews #288 Pleasant Valley #316 Harris #317 Marriott #318 Mountain View #319 Winslow
Biggar System	50	5955	Biggar (2627)	None	Cando (190) Springwater (100)	3038	#347 Biggar #349 Grandview #377 Glenside #378 Rosemount
Kerrobert System	44	9975	Kerrobert (1232)	Luseland (730) Coleville (485) Macklin (825)	Denzil (285) Tramping Lake (245) Major (165) Smiley (125)	5883	#320 Oakdale #321 Prairiedale #322 Antelope Park #350 Mariposa #351 Progress #352 Heart's Hill #381 Grass Lake #382 Eve Hill
Unity System	59	9125	Unity (2343) Wilkie (1522	Cutknife (560)	Senlac (95) Scott (250) Landis (300)	4055	#379 Reford #380 Tramping Lake #409 Buffalo #410 Round Valley #411 Senlac #439 Cutknife

[a]The community systems approximate the school units - see text.
[b]All population data are from the 1971 Census. Population figures except for "downtowns" are rounded.
[c]Open country population includes persons resident in centres of less than 100 (except for Senlac), and farm and rural non-farm population.

Source: Census of Canada, 1971.

community residents would conduct most of their day-to-day "trading" in various goods, services, and social interaction.

Additional support for the suggestion that the school units represent total community systems is the fact that their boundaries were determined with a large local-level input. Revisions to the original boundaries were made in conjunction with the introduction of grid roads in the period 1959-61. The municipalities and the school units co-operated to set the most suitable boundaries for commuting and busing. The road networks centre on the rural "downtowns" and link the other centres and the open-country residences in each school unit.

Although school units appear to represent total community systems, they are not composed of complete units of local government (i.e. rural municipalities). Since data are published only on the basis of incorporated units, the school units have been used as a guide for selecting the rural municipalities in each system. Where half or more of a rural municipality lies within a school unit, the whole municipality has been assigned to that community system.

The main features of the community systems, named according to their largest centre, are summarized in Table 2. Population ranges from 5,955 to 9,975, with four of the systems having 9,000 or more. The remaining two, the Biggar and Eston systems, have populations of 5,955 and 6,510. Five of the systems have one major centre that qualifies as a rural "downtown" and the sixth, the Unity system, has two such centres. Most have two or three "community centres", although the Biggar system has none and the Unity system has one[10]. Most have three to five "neighborhood centres", although the Eston system has none and the Biggar system has two. They contain four to eight rural municipalities and one to four incorporated towns.

IMPLICATIONS OF VIEWING COMMUNITIES AS SYSTEMS

The difficulty with rural community systems as described in the previous section is that they are not readily recognized as real, working units of social and economic organization. The systems are seldom, if ever, formally organized as a political unit and they never bear a name. Yet they are created by rural people as they go about day-to-day living. What are readily recognized are the various parts of rural community systems--the trade centres of different sizes and roles, and the political units (towns, villages and rural municipalities). The question, then, is what use is it to think of a community as something other than each separate centre or political unit?

A critical issue on the Prairies is whether sufficient numbers of rural people are now, and will remain, living in rural community systems to ensure a desirable quality of life, now and in the future. The post-war years that have seen a sorting process among Prairie trade centres have also seen a drastic decline in the number of rural families, both farm and non-farm. The number of people to support rural institutions, public and private, has declined to a critical level. The notion presented in this article is that if a different concept of community organization were to underlie rural development efforts, policies could be devised to raise levels of rural well-being more effectively and efficiently. A type of area organization that unites a constellation of small places and political units could minimize the public and private costs of delivering community services, both public and private, in areas of sparse population.

The comparison of community systems to market systems illustrates the problem. On one hand, total demand from all households must be sufficient to keep any necessary "supplier" operating by assuring him adequate returns. However total demand in any community system decreases with population loss. On the other hand, if local suppliers go out of business because of decreasing total demand for their services, the remaining families cannot commute further than some relevant distance limit without incurring a loss in quality of life. These interacting forces, then, raise important questions about the availability, accessibility and comparable quality of goods, services, and social and economic opportunities for rural people.

Attempts to grapple with these problems require rural development efforts involving more than policies aimed solely at increasing incomes of rural people, however necessary such efforts are. Rural development also requires that desirable communities survive so that incomes, however large, can be translated into real well-being at reasonable cost and within reasonable distance. The problem is how, in view of the sparse population (or decreasing local market demand) to obtain the best returns from any potential rural development budget.

A common approach to development is to focus attention on regions, or broad areas of a province. This

[10] The Unity system has fewer community centres perhaps because it has two "downtowns".

strategy uses a "growth centre" technique of development in which a city is selected as a site for investments to induce growth. This growth is expected to benefit people within a large radius, e.g., a few hundred miles, of the centre. While this strategy is effective in equalizing growth on a national scale, it cannot offer direct benefits to rural people except for those within the immediate environs (radius of 25 to 30 miles) of the growth centre. Regional development strategies, then, are not an effective means of increasing rural well-being because regions are too large and because their growth centres are too far away from the communities in which most rural people reside. For most rural families, taking advantage of opportunities provided by growth centres would involve migration to an urban centre.

Another common approach to community development is to concentrate on each separate place or municipality. Authorities designing programs on this basis, however, must pump in development funds to keep all places going at the same level of activity, or risk being accused of favoring one place rather than another. The danger is that the funds might be spread too thinly with no real and lasting results on the one hand, or create an unnecessary rivalry between local administrations and political instability on the other. Further, in the markets for private suppliers, it often means competition among centres for scarce resources, whether firms or professionals willing to locate in rural areas, or capital for facilities. The centre getting the scarce resources then sees itself as a winner while the neighboring centre sees itself as a loser.

The community system notion presented here is compatible with a middle-ground development strategy that combines the elements of both the regional and individual community approaches. It would permit application of the growth centre technique, but at a local scale, by promoting "downtowns" as mini-growth centres for more specialized economic and public services. Location of these activities in "downtowns" means that they are accessible to all residents in the community system, thereby promoting equality of opportunity for rural people. With appropriate agreements among the units in the system, the benefits of new opportunities and facilities could be equally shared so that all centres could see themselves as winners. Co-operating to share costs as well as benefits would avert needless duplication of services, thereby promoting efficiency in the provision of services. Similarly, a combined effort by all parts of the system would give greater weight to proposals made to public authorities.

By recognizing that other kinds of equally legitimate activities (for example, recreational and social) may have different limits to centralization, this notion permits selection of appropriate development activities for smaller centres, which play necessary and important, even though different roles in rural life. With no recognition of their role in the system, and with no appropriate development activities, these smaller centres would still feel they were losing out, and rightly so. The community system approach does not ignore the aspirations of smaller centres, but it does acknowledge that the kinds of activities that can effectively be located in them are changing.

A community system notion does not accept the proposition that only those places with a record of population growth over some recent past could be viable places for human habitation in the future. Rather, it accepts the proposition that rural families have legitimate needs that must be satisfied locally and that sparse population and reasonable commuting distances are real constraints that must be accomodated in development strategies. A middle-ground approach to development has the value of accomodating the spending of rural development funds to the problems of sparse population by promoting local mini-growth centres and yet does not neclect smaller centres. This means that a consortium could be generated among towns, villages and rural municipalities that could result in a brighter future for all places and persons in the system, not just in one municipality and its residents that began with more people.

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1. The Prairie Community System, by Carle C. Zimmerman and Garry W. Moneo, Agricultural Economics Research Council, Ottawa, June, 1971.

2. "Space as a Social Cost" by A.H. Anderson, Journal of Farm Economics, 1950, pp. 411-430.

3. Economic Effect of Rationalization of the Grain Handling and Transportation System on Prairie Communities, by J.C. Stabler, Grains Group, Ottawa, March, 1972.

POLICY AND PROGRAM DEVELOPMENTS

CANADIAN WHEAT BOARD ACT

Canadian Wheat Board Regulations – Amendment (Canadian Gazette August 13, p. 2247)

This amendment established the initial payments announced last March for deliveries by producers to the Canadian Wheat Board for the basic grades of wheat, oats and barley, basis-in-store Thunder Bay or Vancouver, for the 1975-76 crop year. The initial payments are as follows:

No. 1 Canada Western red spring wheat – $4.25 per bushel;

No. 2 Canada Western oats – $1.10 per bushel;

No. 2 Canada Western six row barley – $1.65 per bushel.

These prices are at essentially the same initial level as for the previous 1973-74 and 1974-75 crop years. The 1974-75 initial payments were increased later in the crop year to $3.75/bu., $1.20/bu. and $2.24/bu. for wheat, oats and barley, respectively, to better reflect the changed market situation. When the 1975-76 initial prices were announced by the Honourable Otto Lang, Minister Responsible for the Canadian Wheat Board, in March of this year, it was stated that as in the past three years the prices would be reviewed later in the year when the market situation was clearer, and that they could be revised upwards at that time.

PRAIRIE GRAIN ADVANCE PAYMENTS ACT

(Amending Act No. 2, formerly Bill C-53. Canada Gazette August 27. Statutes of Canada 1974-75, chapter 64.)

This amendment set the interest rate on advance payments during the 1975 crop year at $10^1/_4$ percent per annum. Interest during the preceding crop year was $12^3/_4$ percent.

The first amending act, formerly Bill C-10, under the Prairie Grain Advance Payments Act, was summarized in the April issue of this publication. For the full text, see chapter 34 of Statutes of Canada, 1974-75.

AGRICULTURAL PRODUCTS MARKETING ACT

Marketing of Ontario Grapes-for-Processing (Canada Gazette September 10, p. 2338)

Five sets of regulations applying to marketing of Ontario-grown grapes-for-processing, for interprovincial and export trade. Made under the federal act and the Farm Products Marketing Act of Ontario by the Ontario Grape Growers' Marketing Board.

"Processing" means manufacture of grape products, juice, beverages, spirits or wine from grapes. It includes distilling or fermenting and bottling.

- **Marketing**

The buying and selling of grapes are restricted to producers and licensed dealers. Only purchase and sale terms are allowed; there may be no provision for consignment or rebate, or combination with other products. Buying and selling may be done only on the basis of tonnage.

- **Pricing**

Prohibits selling or buying below the minimum price set by the Negotiating Committee for Grapes-for-Processing. Dealers must pay producers the full price of grapes purchased by November 22 in the year of purchase. Other requirements for payment are stated.

- **Producer Licence Fee**

A licence fee of $2.75 is imposed on every producer for each ton of grapes he produces and uses for processing. Methods of payment, including deduction of licence fees from money payable to producers, are specified.

- **Licensing**

All grape dealers must hold a licence issued by the board. Schedule I shows the form of the application for a licence. Schedule II the form of the licence. Licences expire on December 31 of the year of issue.

- **Information**

Requires producers and marketers of grapes to keep complete and accurate books and records. Dealers must keep records of varieties, weights and grades delivered to them. The regulations set down requirements for inspection of books and records, inspection of premises, and checking of weighing and grading. These regulations were dated August 12, 1975.

Marketing of Ontario Fresh Fruit (Canada Gazette August 13, p. 2249)

Six sets of regulations applying to the marketing of Onatario fresh fruit in interprovincial and export trade. Made by the Ontario Fruit Growers' Marketing Board under the Ontario Fresh Fruit Order.

"Fresh fruits" are peaches, pears, plums and prunes produced in Ontario, other than those used for processing.

- **Marketing**

All buying and selling of fresh fruit by wholesalers and retailers must be done through the board. Shipping also be done through the board and under its conditions. The same applies to transportation.

- **Shippers and Shipper-Dealers**

These regulations govern the appointment of shippers and shipper-dealers, the issuance of certificates to both types, forms and expiry dates of certificates, handling of claims of purchasers for compensation, and conditions under which the board will approve claims for brown rot. The schedules contain sample copies of certificates for shippers and shipper-dealers, and the form of a claim report.

- **Information**

Fresh fruit transported by motor vehicle out of the Niagara regional municipality or Saltfleet Township must be reported to the Fruitland Inspection Station. These regulations also cover the furnishing of daily tally returns to the board and receipts to producers; the inspection of receipts and invoices by the board; and submission to the board of a yearly list of producers from whom shippers and shipper-dealers have received fresh fruit.

- **Handling**

These regulations specify the conditions for grading, packing, inspection, cooling, loading, storing, shipping and delivering of fresh fruit. The requirements for packing peaches are spelled out in detail.

- **Pricing**

Prohibits selling or buying under the minimum price set by the board. Also prohibits selling or buying of fresh fruit on commission or consignment or under other special conditions. Fruit may only be sold at a price per container, not by the acre or by the crop. But if a dealer or shipper-dealer holds the prescribed certificate from the board, he may buy or sell in bulk by the pound for central packing. Methods of payment to producers are prescribed and conditions governing payment of brokerage fees are set down.

- **Service Charge**

Every producer must pay the board a service charge of three-eighths of one percent a pound of fresh fruit marketed by or for him. Methods of payment are described.

Ontario Tender Fruit-for-Processing Order (Canada Gazette August 27).

This order granted authority to the Farm Products Marketing Board of Ontario to regulate for interprovincial and export trade the marketing of peaches, pears, plums, cherries and sour cherries produced in Ontario and intended to be used in processing. The term "processing" means the manufacture of fruit products, or of juice, wines, spirits, etc. It includes canning, bottling, distilling, fermenting, drying, freezing, treating with sugar and chemicals, etc.

The order also gives the board authority to collect levies from producers in the province. The levies are to be used, among other purposes, for the payment of expenses and losses resulting from sale or disposal of tender fruit, and to equalize or adjust the proceeds of sales among producers.

Ontario Turkey Order (Canada Gazette August 27)

Authorizes the Ontario Turkey Producers' Marketing Board to collect levies from Ontario producers. Also under the Farm Products Marketing Act of Ontario.

OTHER PROGRAMS

Sheep

At the end of July Agriculture Minister Eugene Whelan announced a Sheep Stabilization Program for 1975 which guarantees a price support of $47.70 per hundred pounds liveweight. Deficiency payments would be made on all lambs sold for slaughter to packing plants, livestock yards, etc. Sheep were the first named commodity in the revised Agricultural Stabilization Act to be placed under a stabilization program. (See CFE for August).

Another indication of the importance given to sheep production was a statement early in August by a representative of Agriculture Canada's Livestock Division. "In 1973," he said, "Canada produced just over a quarter of the lamb and mutton it consumed, and only about six percent of the wool it used. Production of both these commodities could be greatly expanded without producing a surplus; sheep are economical animals to produce, they thrive on marginal land, they can be supported on much less land than cows, and lambs sell for more than a beef producer can get for a calf." Over a five-year period the federal government is contributing $750,000 to the Canadian Sheep Marketing Council to boost production of lamb and wool.

Peaches

A special federal program to assist Ontario peach growers was announced on August 28. To aid farmers whose markets were disrupted by the closing of a big processing company, the Agricultural Products Board agreed to buy part of this year's bumper crop and have it canned. The processed peaches were to be sold later on the domestic market. The Ontario Tender Fruit Growers' Marketing Board acted as agent for the federal government in buying and selling.

Geraniums

Geraniums are the latest crop to be assisted by Agriculture Canada's New Crop Development Fund (NCDF) They are part of an ornamental plant industry with more than $60 million in farm cash income, and the market is expanding steadily. $25,266 from the fund has been committed to help the program under the supervision of Agriculture Canada and the Ontario Ministry of Agriculture and Food. The NCDF was started in 1973 to help farmers bring new crops into commercial production.

PUBLICATIONS

ECONOMICS BRANCH

Available from Publications Manager, Economics Branch, Agriculture Canada, Ottawa, KlA OC5

Prairie Regional Studies in Economic Geography No. 22 – The Russell Region of Manitoba. H.R. Fast and D.A. Neil, Publ. 75/9. June 1975. 171 p.

Provincial Legislation Pertinent to Agriculture: Manitoba, Saskatchewan, Alberta, British Columbia. A.R. Jones. Various paging. Publ. 75/11. Free.

European Community Markets for Soft Oils: Implications for Canada. O.A. Al-Zand. 55 p. Tables, charts. Publ. 75/13. Free.

Farm Business Summary, Manitoba/Saskatchewan 1974. M.M. Sorboe. October 1975. 50 p. Publ. 75/18. Free.

AGRICULTURE CANADA

Available from Information Division, Agriculture Canada, Ottawa, KlA OC7.

Market Cattle Testing for Brucellosis and Tuberculosis Ottawa, revised 1975. Folder. Publ. 1364. Also French. Free.

Livestock Market Review (55 ed.) 1974. Ottawa, 1975 105 p. Tables, graphs, maps. Paper cover. Bilingual. Free.

Farm Letter. Agricultural Stabilization Act. Monthly. Ottawa. July 1975. Bilingual. Free.

Farm and Ranch Equipment for Beef Cattle. Ottawa 1969, revised 1975. 37 p. Paper cover. Publ. 1390. Free.

Provincial Agricultural Policies and Programs. Available for all 10 provinces. Information sheets summarizing objectives, eligibility, technical and financial assistance, administrative contacts. Computerized so that selections can be made to meet a variety of research and administrative requirements. *Order by name of province from CANADEX, at the address given above.*

Food Grading in Canada. Ottawa. Publ. 1283, 15 p. Free.

INFORMATION CANADA

Available from Information Canada, 171 Slater St., Ottawa, KlA OS9

Common and Botanical Names of Weeds in Canada. Ottawa, revised 1975. 67 p. Tables. Paper cover. Publ. 1397. $1.50 per copy (Canada); $1.80 other countries.

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Bill C-53. The Prairie Grain Advance Payments Act, No. 2, an act to amend. July 15, 1975. 9 p. 20¢ a copy. Cat. No. YC25-301/1-24.

Production of Poultry and Eggs 1974. Ottawa 1975. 22 p. Tables, charts. Paper cover. Bilingual. 70¢ a copy. Cat. No. CS23-202/1974.

Agriculture: Cross-classified Socio-Economic Characteriatics of Farm Operators, Canada and Provinces. Ottawa 1975. Various paging $2.80 a copy. Cat. No. CS96-713.

Complete proceedings on Bill C-50. An Act to Amend The Agricultural Stabilization Act. No. 25, July 16, 1975. 13 p. 20¢ a copy. Cat. No. YC25-301/1-25.

Agricultural Trade in Europe Economic Commission for Europe. Agricultural Trade Review, No. 12. FAO, United Nations, New York. 1975. $5 (U.S.) a copy.

Canada's Trade Options. Economic Council of Canada. R.J. Wonnacott, 1975. 218 p. Cat. No. EC-22-24/1975. $4.75.

Diversification, Foreign Investment and Scale in North American Manufacturing Industries. Economic Council of Canada. R.E. Caves. 1975. 76 p. Cat. No. EC 22-23/1975. $2.50.

Looking Outward: A New Trade Strategy for Canada. Economic Council of Canada. 1975. 206 p. Tables, graphs. Cat. No. EC 22-27/1975. $5. A summary is also available entitled "An Outline of a New Trade Strategy for Canada".

Canada – United States Free Trade and Canadian Independence. Economic Council of Canada. P.V. Lyon. 42 p. Cat. No. EC 22-25/1975. $1.25 Canada; $1.50 other countries.

OTHER PUBLICATIONS

Sugar Prices II. The Canadian Refining Industry. Food Prices Review Board. August 1975. 30 p. Tables, charts. Bilingual. Write the board at P.O. Box 1540, Station B, Ottawa, KlP 5Z5.

Waste Recycling and Canadian Agriculture. Proceedings of National Conference on Commercial Waste Utilization as Animal Feed, Toronto April 22-24, 1975. Agricultural Economics Research Council of Canada. 260 p. Write the council at 100 Bronson Ave., Suite 203, Ottawa, KlR 6G8.

An Examination of the Inland Terminals Approach in Rationalizing the Prairie Grain Handling and Transportation System. Surendra N. Kulshrestha. Extension Division, University of Saskatchewan, Saskatoon. Publ. 266, April 1975. 27 p. Tables, charts. Write the author at the University.

Grains and Oilseeds – Handling, Marketing and Processing. Canadian International Grains Institute. 650 p. $11.50. Write the institute at 1000 - 303 Main St., Winnipeg, R3C 3G7.

Food Aid and International Economic Growth. Uma K. Srivastava, Earl O. Heady, Keith D. Rogers and Leo V. Mayer. The Iowa State University Press. 160 p. Hard cover. Write Iowa State University Press, Ames, Iowa, 50010. Cost not known.

Agricultural Statistics for Ontario, 1974. Ontario Ministry of Agriculture and Food. Publ. 20. 52 p. *Write O.M.A.F., Parliament Buildings, Queen's Park, Toronto, 182.*

DEFINITIONS

The following definitions are provided to help readers better understand the articles in this issue:

Article No. 1

Personal income – the sum of current receipts of income whether or not these receipts represent earnings from production. It includes transfer payments from government (such as family allowances, unemployment insurance benefits and war service gratuities) in addition to wages and salaries, net income of farm and non-farm unincorporated business, interest, dividends and net rental income of persons. It does not include undistributed profits of corporations and other elements of the national income not paid out to persons.

Personal Disposable Income – the residual of personal income after the payment of direct federal and provincial taxes.

Marketing Bill for Food – the total cost of all goods and services necessary to convert farm food into a form acceptable for retail sale. It includes processing, packaging, transportation, storage, retailing, advertising and sales promotion, and all other costs directly related to these functions.

Article No. 2

Waste Heat – heat that is not put to full use or proper use because it is superfluous to the actual product.

Cultivar – term frequently used in horticulture to signify a plant in cultivation.

Article No. 3

Rural Community System – a collection of several centres of various sizes and the open-country residences around them within a total radius of 25-40 miles of the major centre in the system.

Full-Fledged Community System – one that contains sufficient numbers and kinds of establishments, organizations, facilities and opportunities to satisfy those household demands that occur regularly and frequently.

IN REPLY

Three readers wrote thoughtful comments on an article in the April issue, "An Approach to Identifying and Locating the Low-Income Farmer." Alfred Birch, a research economist with Alberta Agriculture, Edmonton, felt the authors could have omitted some statistical material in the appendix. Most people working with income statistics, he thought, should be familiar with the sources cited and could do without a reprinting of available data. The general approach was good, he felt, as was the brief treatment of capital gains; but he wondered how nearly complete their references were.

On the first point, the authors reply: "The appended statistical material referred to was included so that the critical reader could follow through completely, step by step, to our conclusions. This was thought to be particularly important because of the degree of approximation and the number of assumptions involved. We wished to draw attention to, but not apologize for, the fact that the analysis was a 'quick and dirty' one, as some analyses have to be. We wanted our arithmetic to be fully visible." On the point of references, the authors say "Given the brevity of the study, it cannot be claimed with confidence that all existing empirical evidence relating to capital gains in Canadian agriculture was taken into account." They list some references that deal with the subject but do not necessarily offer empirical data not ready considered:

(a) Two Studies of the Canadian Royal Commission on Taxation (Carter Commission):

1 – #19: "Taxation of Capital Gains", G.R. Conway. Feb. 1967, Queen's Printer, Ottawa.

2 – # 19 B: "The Law Concerning Capital Gains,"

G.R. Conway & J.G. Smith, Feb. 1967, Queen's Printer, Ottawa.

(b) Two publications of the Agricultural Economics Research Council of Canada:

1 – #10: "Assets, Liabilities and Net Worth of Canadian Farm Operators 1935-64," M.L. Lerohl, March 1967.

2 – #14: "The Farmer's Interest in Carter's Taxes," M.L. Lerohl, Dec. 1967, (pp 17-19).

Robert N. Plank, Assistant Branch Manager of the Farm Credit Corporation in Kelowna, B.C. agreed with the authors that more research and data collection is needed on four-way joint distribution of real farm family income. "I would also welcome research and discussion on merits and demerits of 'part-time' farming," he writes. The authors reply:" 'Part-time farming' is now receiving explicit attention from the Economics Branch of Agriculture Canada. A study originating in the Farm and Rural Development Division has been under way for several months. "

R.W. Lodge, Land Use Service DFRA, Regina, commenting on the same article, says "the need for this approach is very great in our (and many other) programs". He adds that he would like to see more articles, both investigative and philosophical, that relate to the socio-economics of farming.

Georges Rousseau, an agronome in St. Barthelemy, Quebec, found the February issue very useful. He says the article on input substitution and productivity was good for reference, and he gained new knowledge about the many factors affecting agricultural production. The article on energy was helpful for his own personal documentation and the machinery article useful in the preparation of budgets.

Yves Bricault, an agronomist and farmer in Chambly, Québec, thought the February issue was very instructive. The article on Fertilizer Situation and Outlook he found "full of topical interest. The practical side was well discussed. I am interested as a practical farmer as well as an agronomist."

Glen Roy, a farmer in Kensington, Prince Edward Island, found the article on Cow-Calf Production in the June issue "most useful, especially at a time when profits are almost non-existent and a cow-calf operator must necessarily ssek means of avoiding unnecessary expense." And he adds, "We find the articles in Canadian Farm Economics both informative and instructive."

Harold H. Phillips, a retired farmer in Langdon, Alberta, found the June article on "The Potato as a World Food Source" very useful and wrote, "I am impressed with the possibilities for increased food production with potatoes, especially in India".

Omer Pepin, a dairy farmer from St. Bonaventure, Quebec, is happy to remain on the mailing list for CFE after a four-year term on the provincial Feed Grain Board. "I am particularly interested in articles on marketing, grains, corn and drainage", he says.

The editors urge more readers to comment on articles in this publication. Suggestions on topics for future articles are also welcome.

IN REPLY TO AUTHORS AND EDITORS REGARDING OCTOBER '75 *CANADIAN FARM ECONOMICS*

I have read the following article(s):

(1) Farm Food Marketing Costs
(2) The Economics of Waste Heat Utilization for Controlled Environment Production of Agricultural Products
(3) The Prairie Community System

My comments are on article number

This article was: not useful 1 2 3 4 5 6 7 8 9 10 very useful.

Because (e.g., The most important economic and social factors were studied. The work was well documented and the conclusions were useful to me).

Beefs Bouquets (Suggestions to authors, publications committee and editors)

My comments may ( ) may not ( ) be used in a future issue of this publication if the editor wishes.

NAME (Please print) . . . . Occupation . . . .

ADDRESS . . . .

Please place this sheet in an envelope and address it to:

IN REPLY,
Att: John McConnell,
Economics Branch,
C.D.A., Sir John Carling Building,
OTTAWA, Ontario, K1A 0C5

CANADA DEPARTMENT OF AGRICULTURE
OTTAWA, ONT.
K1A 0C5

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VOLUME 10 NUMBER 6 DECEMBER 1975

CANADIAN FARM ECONOMICS

Agriculture Canada

HON. EUGENE WHELAN, MINISTER — L. DENIS HUDON, DEPUTY MINISTER

Canadian Farm Economics is published bi-monthly by the Economics Branch, Canada Department of Agriculture, Sir John Carling Building, Ottawa, and is based on material prepared by economists of the Economics Branch.

Purpose: To provide current information on agricultural economics for economists, representatives of extension, education, press, agri-business, trade, foreign offices, bio-physical and social science researchers, administrators, librarians and leading farmers.

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Letters from readers: Letters are encouraged and should be addressed to the author or the Managing Editor. Responses . . . comments, suggestions and points of view are important for effective two-way communications. Letters may be used in the following issue of CFE and will be edited prior to publication where necessary.

NATIONAL AND REGIONAL PRODUCTIVITY OF CANADIAN AGRICULTURE, 1961 TO 1974

D.M. Shute*

Agricultural productivity (output per unit of input) showed an increasing trend in Eastern Canada between 1962 and 1974 while decreasing trends occurred in the West. The Prairie Provinces and British Columbia, however, increased output at faster rates than any Eastern area other than Ontario.

PRODUCTIVITY

Canadian agriculture in the past was greatly dependent on real estate and labor inputs. Agriculture today though is becoming more specialized and as a result more dependent on many inputs besides real estate and labor. Real estate's importance has remained about the same for Canada in the last 14 years while labor inputs have declined and other capital inputs have continually increased (Figure 1). The fact that output per unit of labor input has increased continually since 1961 is of no satisfaction if the increased capital inputs required to offset the labor loss over-ride the importance of the increased output. It is for this reason that in studying the productivity of Canadian agriculture today, it is necessary to develop an index that takes into consideration all inputs required for production. The measures used in this study or the productivity indexes, are aggregations, by province, of the price-deflated output per unit of price-deflated inputs, i.e., they are indexes of volume. Inputs include not only real estate and labor but all other capital inputs such as machinery, livestock, purchased feed and seed, fertilizer, and miscellaneous inputs such as custom work and pesticides.

*D.M. Shute is an economist in the Marketing and Trade Division, Economics Branch, Agriculture Canada, Ottawa.

PRODUCTIVITY GROWTH

National Trends

The productivity of Canadian agriculture decreased about 5.2 percent between 1973 and 1974, reducing the growth rate of agricultural productivity to .07 percent annually between 1962 and 1974 from .3 percent annually between 1962 and 1973[1] (Table 1). This resulted from a decrease in farm output between 1973 and 1974 of 2.6 percent combined with an increase in production inputs of about 2.6 percent.

While total 1974 farm output decreased 2.6 percent from 1973, cattle production excluding calves increased nearly 15 percent, surpassing the previous record production of 1973. Every other category of farm output decreased, however, offsetting the gain in livestock output. Grains and oilseeds decreased nearly 17 percent as a result of unfavorable growing conditions, to the lowest level since

[1] It should be noted that in 1961 output of grains from the Prairie region, which has a significant effect on the total output index, was seriously reduced as a result of drought. Thus much of the gain in output in the period 1961 to 1974 was due to the 28-percent increase from 1961 to 1962. For this reason, growth rates for Canada and the provinces will be discussed in terms of 1962 to 1974 data.

TABLE 1. INDEXES OF OUTPUT, INPUTS AND PRODUCTIVITY (OUTPUT PER UNIT OF INPUT), CANADIAN AGRICULTURE, BY REGIONS, 1961 TO 1974 (1961=100)

Index by Region	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	Annual Growth Rates 1961-74	1962-74
															— percent —	
Farm Output																
Maritimes	100	101	100	100	100	106	106	108	108	104	103	99	97	104	.10	.03
Quebec	100	105	105	103	104	109	113	118	117	118	117	109	111	117	1.05	.94
Ontario	100	105	106	109	109	118	115	118	118	125	126	127	122	133	1.93	1.83
Prairies	100	160	188	161	181	212	164	184	197	161	207	191	205	184	2.64	1.10
British Columbia	100	110	113	119	109	127	126	124	117	130	135	130	140	131	1.98	1.71
CANADA	100	128	140	130	137	155	135	145	150	138	157	149	154	150	2.04	1.25
Production Inputs																
Maritimes	100	91	83	88	87	87	83	81	81	82	79	77	81	85	−1.17	−.82
Quebec	100	100	100	98	100	100	105	105	102	103	101	104	105	107	.48	.52
Ontario	100	100	106	106	107	108	113	112	113	113	114	113	117	117	1.16	1.09
Prairies	100	102	104	106	106	106	110	111	111	110	112	115	119	128	1.46	1.44
British Columbia	100	103	93	102	105	117	120	124	129	136	143	145	146	147	3.81	3.98
CANADA	100	101	102	104	104	105	109	109	109	109	111	113	115	118	1.17	1.18
Productivity																
Maritimes	100	111	120	114	115	122	127	133	133	127	130	129	120	122	1.29	.86
Quebec	100	105	105	105	104	109	108	112	115	115	116	105	106	109	.58	.42
Ontario	100	105	100	103	102	109	102	105	104	111	110	112	104	114	.75	.72
Prairies	100	157	181	152	171	200	149	166	177	146	185	166	172	144	1.17	−.35
British Columbia	100	107	121	117	104	108	105	100	90	95	94	90	96	89	−1.73	−2.13
CANADA	100	127	137	125	132	148	124	133	137	127	142	132	134	127	.86	.07

the LIFT program year in 1970. Hog production was down 4 percent to the lowest level since 1969 while poultry production decreased about 7 percent. Dairy production declined less than 1 percent.

Regional Trends

Agricultural productivity increased from 1973 in the Maritimes, Quebec and Ontario but decreased in the Prairie region and British Columbia (Table 1). Productivity, or output per unit of input, increased in the Maritime Provinces at the annual rate of .9 percent from 1962 to 1974, the highest rate of increase in any of the provinces or regions studied. This was largely the result of a decrease in total farm input usage of 7 percent between 1962 and 1974 rather than the 3-percent increase in output for the same time period. In other words, while output increased .03 percent annually between 1962 and 1974, farm inputs decreased at the rate of .8 percent.

Agricultural productivity in Ontario showed the second highest rate of increase between 1962 and 1974, increasing at the annual rate of .7 percent. Output increased 27 percent at the annual rate of 1.8 percent while inputs increased 17 percent at the annual rate of 1.1 percent. Quebec showed the third highest productivity growth between 1962 and 1974 increasing at the rate of .4 percent per year. This was a result of output increasing 11 percent at the annual rate of .9 percent while production inputs increased only 7 percent at the rate of .5 percent annually.

Agricultural productivity in the Prairie region decreased between 1962 and 1974 at the annual rate of .4 percent. While output increased 15 percent, at the annual rate of 1.1 percent, production inputs increased even more, 25 percent at the rate of 1.4 percent per year. British Columbia exhibited decreased productivity growth between 1962 and 1974 to an even greater degree than the Prairie region. Agricultural productivity decreased 17 percent at the annual rate of 2.1 percent. Output increased 19 percent or 1.7 percent annually but production inputs increased 43 percent, nearly 4 percent annually.

The over-all effect of decreased productivity in the Prairies and British Columbia was enough to lower the national average growth in agricultural productivity to .07 percent annually between 1962 and 1974.

CHANGES IN INPUTS

National Trends

Real estate inputs on the national level increased about 4 percent from 1973 but still comprised about 29 percent of total inputs (Table 2, Figure 1). All categories of real estate outlays increased in 1974, particularly taxes, which increased from 1973 about 13 percent.

Labor inputs increased from 1973 about 1.0 percent, and comprised the same percentage of total inputs in 1974 as 1973 or 20 percent. This occurred despite an increase in the hired farm labor price index between 1973 and 1974 of 18 percent.

Total capital inputs were up about 2 percent from 1973 reflecting increases in machinery, fertilizer and miscellaneous inputs such as pesticides and twine.

Farm machinery and equipment, and associated fuel, repairs and depreciation inputs were up in 1974 about 8 percent from 1973. Increases occurred in all areas of machinery inputs, but the most significant increase occurred for machinery repairs. This item increased 17 percent from 1973.

Livestock and purchased feed and seed inputs were all down from the levels of usage achieved in 1973. Livestock inputs decreased about 8 percent, as a result of decreased interest on investment in livestock and purchased livestock. Purchased feed inputs reflected decreased livestock inputs by a reduction of about 12 percent from 1973. Purchased seed and nursery stock inputs also decreased from 1973 about 7 percent.

Fertilizer and lime inputs were up again in 1974, 10 percent from 1973.

The usage of farm inputs designated "miscellaneous" was also up from 1973, about 4 percent. Pesticide and twine usage was responsible for most of the increase in this category.

TABLE 2. INDEXES OF MAJOR INPUTS, CANADIAN AGRICULTURE, BY REGION, 1961 TO 1974 (1961=100)

Indexes & Region	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	Annual Growth Rates 1961-74	Annual Growth Rates 1962-74
															— percent —	
Real Estate																
Maritimes	100	101	102	102	103	100	93	93	90	93	89	93	96	97	–.78	–.84
Quebec	100	101	101	98	98	101	99	98	96	102	95	98	103	104	.06	.09
Ontario	100	100	101	101	102	103	105	106	106	104	101	102	102	106	.28	.24
Prairies	100	101	101	101	103	103	107	110	111	116	118	119	121	126	1.90	2.02
British Columbia	100	104	104	107	113	121	132	142	151	163	168	179	188	193	5.81	6.03
CANADA	100	101	101	101	102	103	106	109	108	114	115	117	119	124	1.68	1.78
Labor																
Maritimes	100	80	62	69	62	58	53	47	47	47	42	35	36	40	–6.68	–6.02
Quebec	100	96	90	83	84	77	83	88	78	76	71	70	64	62	–3.12	3.03
Ontario	100	98	106	99	93	86	91	88	84	82	83	72	75	74	–2.67	2.82
Prairies	100	100	100	99	91	80	81	77	81	76	77	76	72	76	–2.69	2.71
British Columbia	100	100	67	82	82	93	93	96	85	85	93	82	78	74	–.86	.49
CANADA	100	97	95	92	87	80	82	80	78	75	75	70	68	69	–2.75	2.94
Capital (All other inputs)																
Maritimes	100	101	104	106	114	120	118	120	123	124	124	127	134	140	2.42	2.40
Quebec	100	104	109	112	116	122	130	126	130	131	133	141	147	153	3.04	2.95
Ontario	100	100	108	114	120	126	132	132	135	139	141	146	153	152	3.51	3.32
Prairies	100	104	109	116	122	132	138	141	136	136	138	145	158	176	3.68	3.56
British Columbia	100	104	108	116	120	136	136	135	152	162	170	177	176	178	4.99	4.96
CANADA	100	104	110	116	121	129	136	137	138	138	140	148	155	158	3.39	3.23

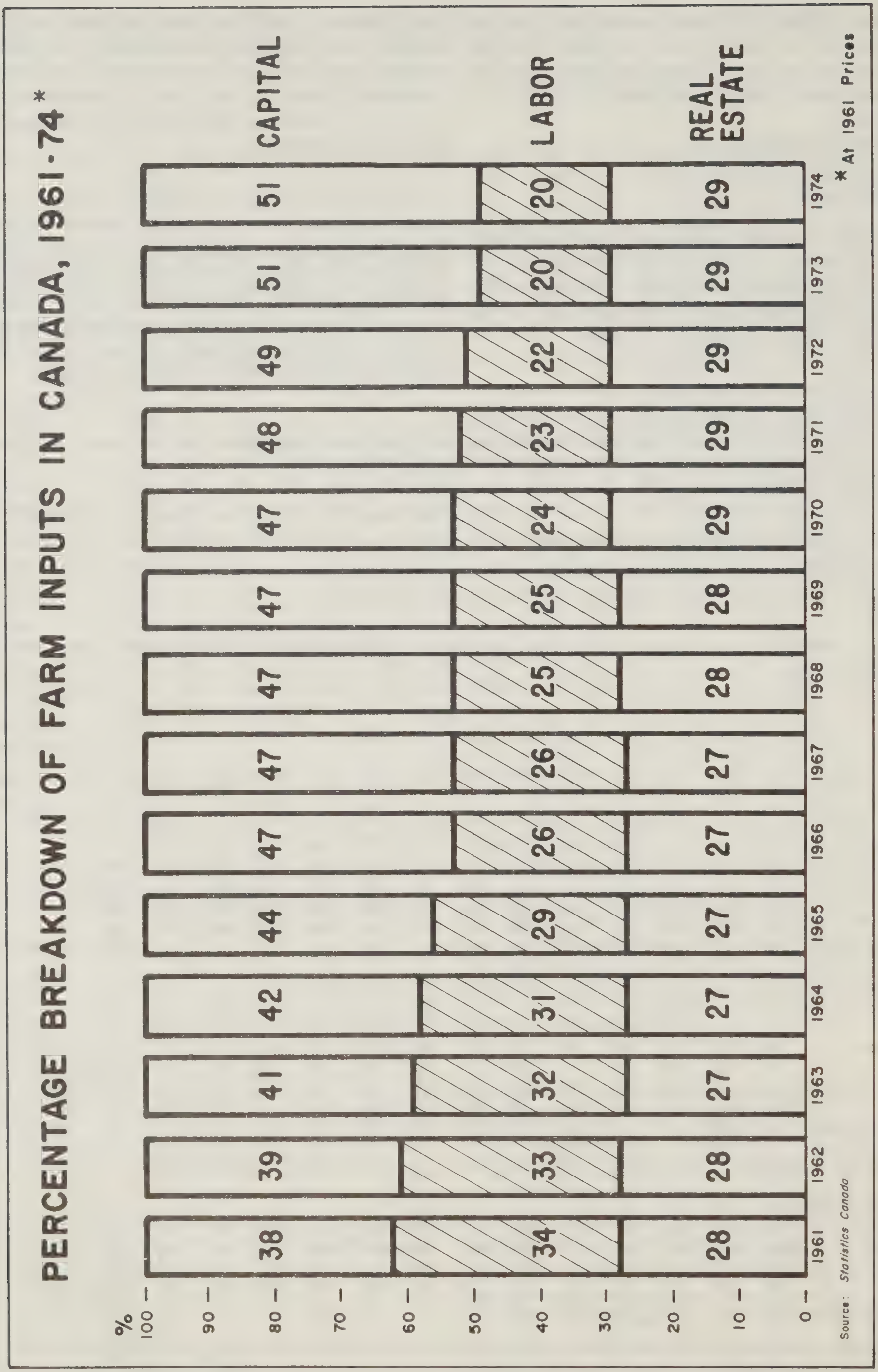
PERCENTAGE BREAKDOWN OF FARM INPUTS IN CANADA, 1961-74*
CAPITAL
LABOR
REAL ESTATE
%
100
90
80
70
60
50
40
30
20
10
0
1961 38 34 28
1962 39 33 28
1963 41 32 27
1964 42 31 27
1965 44 29 27
1966 47 26 27
1967 47 26 27
1968 47 25 28
1969 47 25 28
1970 47 24 29
1971 48 23 29
1972 49 22 29
1973 51 20 29
1974 51 20 29
* At 1961 Prices
Source: Statistics Canada

Figure 1

Regional Trends

Real estate inputs were up from 1973 in all areas studied (Table 2). In the Maritimes, although real estate inputs have declined since 1962 at the annual rate of .8 percent, they increased slightly in 1974. Real estate inputs in Quebec increased between 1962 and 1974 at the annual rate of .1 percent, with increases largely in the form of building repairs and taxes. Ontario's real estate inputs increased slightly more than Quebec's at the rate of .2 percent annually between 1962 and 1974. Real estate inputs in the Prairie region increased much faster than in any of the eastern provinces, increasing 25 percent since 1962 at the rate of 2.0 percent per year. Most of the increase here was for building and fence repairs. British Columbia showed the largest increase in real estate inputs of all, increasing 86 percent between 1962 and 1974 at the annual rate of 6.0 percent. As with the other regions the largest increases were for building and fence repairs.

Labor inputs decreased dramatically in the Maritime region between 1962 and 1974, 50 percent, at the rate of 6.0 percent annually. Quebec also showed a large labor decrease of 35 percent at the rate of 3.0 percent per year. Labor inputs in Ontario and the Prairie region declined at about the same rate between 1962 and 1974 or 2.7 percent annually. Labor inputs decreased in British Columbia about the same amount as in the Prairies and Ontario but at a slower rate than either, .5 percent annually.

Capital inputs have been increasing since 1962 in all provinces or regions, ranging from a 39-percent increase in the Maritimes to a 71-percent increase in British Columbia. Machinery and equipment made up most of the capital other than real estate in all areas. In the Maritimes between 1961 and 1974 machinery inputs[2] increased 35 percent at the annual rate of 2.2 percent and provided 22 percent of all inputs in 1974. An increase of 60 percent occurred in Quebec at the annual growth rate of 3 percent. Machinery was slightly less important in Quebec, providing 20 percent of total inputs in 1974. Increases in Ontario were slightly less than in Quebec, 58 percent, but at the higher annual rate of 3.4 percent. Machinery inputs here, as in the Maritimes, provided about 22 percent of total inputs. Increases in the Prairie region totalled 61 percent since 1961 increasing at the annual rate of 2.8 percent. They comprised 33 percent of total inputs in 1974, the highest of any province or region. The greatest increase for machinery inputs occurred in British Columbia and totalled about 115 percent since 1961 or 6.1 percent annually. Despite this large increase, machinery inputs here accounted for only 18 percent of total inputs. The largest increases in machinery inputs were for machinery repairs in all areas studied. In British Columbia, however, petroleum usage also increased significantly, 170 percent since 1961. No other area displayed petroleum input increases of even half this amount.

Livestock inputs varied across the country. A decreasing trend has occurred in the Maritimes since 1961 at the annual rate of .7 percent. In Quebec, however, increases occurred at the rate of 1.3 percent per year. Although livestock inputs did increase in Ontario since 1961, the growth rate was not as high as in Quebec or .5 percent annually. Much larger increases in livestock inputs, of 3.1 and 2.4 percent annually occurred in the Prairies and British Columbia, respectively.

Purchased feed was one input that showed fairly strong growth rates between 1961 and 1974 in all areas studied. The Maritimes and Ontario increased purchased feed inputs at the annual rate of about 3.5 percent while in Quebec they increased 2.7 percent annually. The largest increase in purchased feeds occurred in the Prairies, about 182 percent since 1961, at the annual rate of 6.9 percent. British Columbia increased purchased feed inputs at the annual rate of 4.8 percent, second only to the growth rate for the Prairies.

Purchased seed and nursery stock inputs showed the highest growth rate between 1961 and 1974 of all inputs in all areas but the Prairies where it was exceeded by both the growth rate for purchased feed and fertilizer inputs. Ontario had the highest growth rate for purchased seed and nursery stock, increasing at the annual rate of 11.1 percent. These inputs increased at the annual rate of 10 percent in the Maritimes and Quebec, 8 percent in British Columbia but only 6 percent in the Prairies.

Fertilizer and lime inputs increased in all areas with growth rates between 1961 and 1974 ranging from 1.3 percent annually in the Maritimes to 12.1 percent annually in the Prairies. Miscellaneous inputs also increased in all areas with growth rates ranging from 1.8 percent annually in the Maritimes to 3.9 percent annually in British Columbia. Most of the increase in miscellaneous inputs was attributable to increased pesticide and twine usage.

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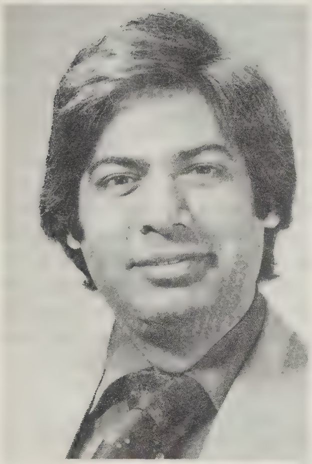
[2] Individual capital inputs are discussed in terms of 1961 to 1974 growth rates because of lack of time for recalculation on a 1962-to-1974 basis before the publication date. However, differences in growth rates for inputs are negligible when 1961 data are omitted.

SUMMARY

It is interesting to note that the increase in agricultural productivity trends occurred in the eastern areas while decreasing productivity trends occurred in the West. The Prairies and British Columbia, however, had increased output at faster rates than any eastern area other than Ontario between 1962 and 1974. Output in Ontario increased 1.8 percent per year while output in the Prairies and British Columbia increased 1.1 and 1.7 percent, respectively. The decrease in productivity was a result of much higher rates of increase for farm inputs in the West than in the East particularly for real estate. While real estate inputs in Ontario increased .2 percent annually, real estate inputs in the Prairies and British Columbia increased annually by 2.0 and 6.0 percent, respectively. Real estate inputs comprised 39 percent of all inputs in British Columbia in 1974 and 29 percent in the Prairies compared to 24 percent in Ontario and only 18 percent in Quebec and the Maritimes. The farm input price indexes were higher in the West in 1974 for real estate, seed, prepared feed and small tools.

It must also be realized that in the Prairie region, particularly, the total output figure is largely a reflection of grain production which is largely affected by the weather. Although the potential output may warrant large increases in inputs, adverse weather can restrict the output even with increased input usage, lowering the productivity or output per unit of input.

FARM MACHINERY*



*Z. Piracha***

With the possible exception of large tractors, machinery supplies should be adequate in Canada in 1976 and farmers can expect higher prices than in 1975. Tires will be in adequate supply although shortages of the larger sizes may develop.

INTRODUCTION

The Canadian farming industry has undergone major changes during the past two decades. As in all other developed countries, it has experienced major changes in the use of farm inputs especially the substitution of capital for labor in response to changing relative prices of these inputs. This substitution of machinery for labor has been one of the most important factors contributing to increased farm productivity. Between 1951 and 1974, farm machinery operating and depreciation expenses in current dollars in Canada quadrupled from $286 million to $1,022 million. From the standpoint of sales of farm machinery, there has been a definite upward trend in Canada, but sales have tended to fluctuate considerably from year to year mainly due to fluctuating economic conditions in agriculture. The importance of farm machinery is shown by the fact that machinery expenses are the largest single component of total farm operating expenses accounting for between one fifth and one fourth over the last 20 years.

SITUATION

Canada relies mainly on imports of farm machinery and equipment to meet her requirements. More than 90 percent of all machinery sold in Canada is imported. The United States alone supplies more than 80 percent of Canada's farm machinery market. Hence, market conditions in the United States are of interest to the Canadian farmer.

The Prairie Provinces are the largest Canadian farm machinery market, accounting for over half of the purchases of new machinery. For some equipment, the Prairie market share is much larger. The share is 80 percent for tractors of 80 horsepower and over, 90 percent for pull-type combines, about 75 percent for self-propelled combines and 60 percent for automatic hay balers. On the other hand, the bulk of the sales in small- and medium-sized tractors is in Ontario, Quebec and the Atlantic Provinces.

Demand in North America for farm machinery has been buoyant since 1972. This is largely attributable to increases in farm incomes. Related factors include increasing world food requirements and the need to replace old machinery. These factors created a continuing strong demand for most purchased inputs in North American markets. Shortages in the supply of machinery occurred between 1972 and 1974, for various reasons: manufacturers' difficulties procuring raw materials and components like steel and tires; strikes during 1974 in the rubber and steel industries, and frequent delays in deliveries.

***Based partially on previous work by P.J. Moore.**

****Z. Piracha is an economist in the Farm and Rural Development Division, Economics Branch, Agriculture Canada, Ottawa.**

After more than two years of shortages in the face of strong demand, the farm machinery market in Canada, except for certain types of heavy equipment, has come nearer to achieving a supply-demand balance in 1975. Both supply and demand factors contributed to the improved availability. On the supply side, procurement problems faced by manufacturers have abated to a large extent. Furthermore, contract wage negotiations in the rubber and steel industries that were a problem in 1974 did not threaten production in 1975. Although demand for machinery continued relatively strong in 1975, particularly in the Prairie Provinces, farmers were more cautious buyers because of the uncertain crop-price outlook. Consequently, inventories have started to accumulate.

This situation is the same in the United States, where reduced demand is the principal reason for the disappearance of that country's equipment shortages. According to the U.S. Department of Agriculture[1], reduced demand, building inventories, and a moderating rate of increase in wholesale prices indicated a continued easing in the supply-demand situation for farm machinery. Sales of all major items in the United States except self-propelled combines were considerably lower during the January-July period in 1975 than in the year before. Sales of tractors and hay balers were both down nearly a fifth and forage harvesters roughly a third. Combine sales in the United States on the other hand, increased 20 percent from a year ago, reflecting big grain crops and a strong demand for combines.

Sales of new farm machinery to Canadian farmers continued strong in 1975 after a record year in 1974. In terms of dollar value, in the first eight months of this year, sales were 33 percent above corresponding 1974 levels (Table 1). Sales of repair parts were up 9 percent. On a regional basis, increases in farm machinery sales (including repair parts) varied from less than 1 percent in British Columbia to 43 percent in Saskatchewan.

The 1975 sales picture is quite mixed, however, if viewed on a product unit basis. The shift towards higher-horsepowered tractors that has been taking place in recent years continued in 1975, as the unit sales of

[1] United States Department of Agriculture, Agricultural Outlook, Washington Economic Research Service, September 1975, p. 12.

TABLE 1. CANADA: FARM MACHINERY SALES, PRICES AND FOREIGN TRADE, AVERAGE 1962-66, AVERAGE 1967-71, 1972, 1973, 1974 AND JANUARY - AUGUST 1974 AND 1975.

	Unit	Average 1962-66	Average 1967-71	1972	1973	1974	January—August 1974	1975
Sales[a]								
All New Machines	Mil.$	328.4	352.0	420.2	573.9	713.7	464.3	618.0
Repair Parts	Mil.$	52.9	66.7	87.9	107.3	132.2	89.6	97.8
Total	Mil.$	381.3	418.7	508.1	681.2	845.9	553.9	715.8
Tractors (Wheel Type)	No.	26,932	21,807	23,508	28,758	29,995	20,546	19,444
Grain Combines (SP)	No.	7,323	4,155	2,846	3,930	3,749	1,939	2,288
Farm Prices							Second Quarter	
All Machines	1961-100	111.3	130.4	141.4	145.8	162.7	157.2	186.5
Repairs[b]	1961-100	106.3	127.5	141.3	145.9	162.4	158.7	183.2
Petroleum Products	1961-100	100.7	111.3	120.0	127.5	144.7	136.4	157.6
All Inputs	1961-100	110.5	128.5	143.3	166.7	195.4	189.6	208.5
Foreign Trade in farm machinery							January-August	
Imports From All Countries	Mil.$	326.5	363.3	490.2	621.9	771.9	495.2	768.2
Imports From U.S.	Mil.$	300.0	320.9	420.1	543.1	675.3	431.0	658.3
Exports to All Countries	Mil.$	138.2	176.5	216.9	290.3	415.3	269.0	364.1
Exports to U.S.	Mil.$	100.3	168.8	204.8	274.0	388.9	252.5	320.3

[a] Valued at dealers' buying price before deduction of dealers' cash discounts etc.
[b] Includes tires and batteries.
[p] Preliminary.

Source: Statistics Canada (i) Farm Implement and Equipment Sales, Cat. No. 63-203 Annual and 63-009 Monthly.
(ii) Farm Input Price Index, Cat. No. 62-004 Quarterly.
(iii) Trade of Canada, Imports by Commodities, Cat. No. 65-007 and Exports by Commodities, Cat. No. 65-004.

large tractors were up 7 percent for the first eight months while sales of small tractors were down 13 percent from corresponding 1974 levels. Sales are expected to pick up in the last two months of the year and total tractor sales to be slightly higher than in the previous year. Two- and four-wheel-drive models of 80 horsepower and over accounted for 43 percent of the total Canadian tractor market in 1974, compared with only 24 percent in 1965. In the Prairie Provinces, their share of the market is much higher, where it rose to 70 percent in 1974 from 43 percent in 1965. However, availability of large tractors continued to be a problem through 1975, as dealers were placed on quota allocations. On the other hand, availability of small tractors improved and delivery times on orders were reduced to six or seven months from 12 to 14 months in 1974. Sales of larger tillage implements to match the larger tractors have been strong in 1975. Unit sales of self-propelled combines were up 18 percent in Canada for the first eight months of 1975 over corresponding 1974 levels with most of the increase in the Prairie Provinces. All provinces experienced increases in combine sales except Ontario where sales were down 10 percent.

The demand for haying machinery fell in Canada during 1975. Sales of automatic hay balers dropped 8 percent (17 percent in the Prairie Provinces) in the first eight months of this year from corresponding 1974 levels. Cattle producers were cautious in purchasing new haying machinery because of the unfavorable beef-price outlook and the heavy slaughter of breeding animals. In addition, with high grain prices, there is less incentive to produce hay. This has resulted in reduced demand for haying machinery and heavy dealer inventories, especially in the Prairie Provinces. The slowing of demand has prompted manufacturers to lower sales expectations anticipated at the start of the year, and even to curtail production.

While the availability of new machinery improved in 1975, there were some complaints by farmers about the supply of repair parts, especially casting parts. Recent environment pollution legislation in the United States has forced some small casting foundries out of business. Similar legislation in Ontario is also putting pressures on foundries. This has resulted in a tight supply of casting repair parts and delays in deliveries.

The prices of all farm inputs rose 10 percent from the spring of 1974 to the spring of 1975, as shown by the Farm Input Price Index (1961 = 100) (Table 1). By contrast, the farm machinery price index, which reflects changes in the prices of new machinery and items used in farm machinery operations, increased 19 percent during the same period. Although availability of farm machinery gradually improved in 1975, the price index increased 19 percent for tractors and combines, and 18 percent for hay balers, based on representative machines. The index for repair parts and petroleum products used in farm machinery operations both increased 15 percent in the same period. Although the average rate of price increase for farm machinery this year has been slightly higher than for all purchased farm inputs, the major machinery companies have not made as frequent price adjustments as they did in 1974. Only one adjustment was expected, in November 1975. In the past, price changes were announced once a year after the main selling season for the year ended. It was only in 1974 that four price changes were announced, mainly because of volatile economic conditions.

OUTLOOK

The outlook for the demand for and supply of farm machinery depends largely on future economic conditions in the North American farm economy. Among the factors to be considered on the demand side, realized net farm income and farm cash receipts have been traditionally used as forecasting benchmarks because of their strong historical relationship with sales of new farm machinery. The supply side focuses on an indication of anticipated marketing trends of the total farm machinery manufacturing industry and supplies of steel and components.

As shown in Table 3, farm cash receipts in Canada reached $6.8 billion in 1973, 20 percent above 1972, and rose to $8.9 billion in 1974, 30 percent above 1973. The rate of increase slowed in 1975 as receipts are expected to increase only 10 percent over 1974 to $9.8 billion. For 1976, Statistics Canada projects that farm cash receipts will decline slightly to about $9.4 billion. Statistics Canada, however, forecasts a 24-percent decline in realized net farm income in 1976 since farm operating expenses are expected to continue rising in the face of stabilizing farm cash receipts.

Farm machinery sales have historically shown a relationship to farm cash receipts and realized net farm income not only in Canada but also in the United States. For instance, farm machinery sales in Canada have been averaging 10 percent annually as a proportion of farm cash receipts since 1964. There is also evidence of a strong relationship between farm machinery sales and realized net farm income of the previous year[2]. It has

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[2] **The correlation ratio for 1960-1974 time series data was 0.92.**

TABLE 2. CANADA: SALES OF SELECTED NEW FARM MACHINERY, IN MILLIONS OF DOLLARS AND AS A PERCENTAGE OF TOTAL SALES, AVERAGE 1962-66, AVERAGE 1967-71, 1972, 1973 AND 1974.

Year	Tractors		Combines		Haying Equipment[a]		Plows[b]		Tillage Machinery[c]		Total Machinery Sales
	Mil.$	Percent of All Sales	Mil.$	Percent of All Sales	Mil.$	Percent of All Sales	Mil.$	Percent of All Sales	Mil.$	Percent of All Sales	Mil.$
Average 1962-66	109.9	33.5	63.4	19.0	30.9	9.4	15.4	4.7	21.4	6.5	328.4
Average 1967-71	113.2	32.2	44.3	12.6	24.3	6.9	13.0	3.7	23.9	6.8	352.0
1972	151.3	36.0	42.9	10.2	29.7	7.1	11.5	2.7	26.1	6.2	420.2
1973	208.2	36.3	67.2	11.7	41.5	7.2	12.2	2.1	40.8	7.1	573.9
1974	239.1	33.5	69.1	9.7	49.4	6.9	16.5	2.3	56.4	7.9	713.7

[a]Haying machinery includes: mowers, rakes, conditioners, balers, etc.
[b]Plows include: moldboard, disc plows, diskers, rotary tillers, etc.
[c]Tillage machinery includes: harrows, rotary hoes, pulverizers, cultivators, rod weeders, etc.

Source: Statistics Canada, Farm Implement and Equipment Sales (Cat. No. 63-203).

been further observed that a 1 percent increase in prices of farm machinery is associated with a 1.6 percent reduction in farm machinery sales.

Assuming these relationships will continue to hold in the future, realized net farm income (one year lagged) effect and machinery price effect are used to project farm machinery sales in 1976. In view of Statistics Canada's projections of farm cash receipts, and on the basis of preliminary data for machinery sales for the first eight months of this year, it appears that demand for farm machinery in general will weaken in 1976. Unit sales, at least of major items of machinery and equipment, will likely be down from 1975. While total tractor sales were up slightly to the fall of this year versus the same period last year, the recent trend to bigger and more expensive tractors (80 h.p. and over) is expected to continue. Two factors will combine to have a dampening effect on the over-all retail demand for machinery in Canada in 1976: first, the expected lower net farm incomes and second, the fact that farmers took advantage of higher incomes from 1972 to 1974 to replace old machinery, with the result that there is less need to purchase new equipment in 1976.

TABLE 3. CANADA[a]: TOTAL FARM CASH RECEIPTS[b], TOTAL OPERATING EXPENSES[c], REALIZED NET INCOME OF FARM OPERATORS FROM FARMING OPERATIONS, SELECTED YEARS 1966 TO 1976.

Year	Total Farm Cash Receipts	Total Operating Expenses	Realized Net Farm Income
		— millions of dollars —	
1966	4,314	3,014	1,742
1967	4,402	3,217	1,670
1968	4,377	3,330	1,581
1969	4,243	3,408	1,415
1970	4,251	3,469	1,345
1971	4,564	3,632	1,469
1972	5,454	3,888	2,125
1973	6,840	4,771	2,746
1974	8,867	5,867	3,843
1975[d]	9,796	6,695	3,960
1976[e]	9,415	7,298	2,996

[a]Excludes Newfoundland.
[b]Cash receipts from the sale of farm products plus federal government supplementary payments.
[c]Includes depreciation charges.
[d]Preliminary.
[e]Forecast.

Source: Statistics Canada, Farm Net Income, Cat. No. 21-202, Annual.

In the United States, demand for farm machinery continued to moderate during 1975 and, as noted earlier, the problems of material shortages experienced in 1974 have abated to a large extent. U.S. net farm income for 1975 is estimated to be about 15 percent below the record 1973 level and this has resulted in an easing of demand pressures and a build-up of machinery inventories to more normal levels.

An indication of anticipated marketing trends and of total farm machinery industry performance in 1975 was provided in a recent forecast entitled "Industry Outlook 1976" by the Canadian Farm and Industrial Equipment Institute (CFIEI). This forecast is based on replies to a

marketing survey of its 22 active members which account for almost 90 percent of the farm machinery market in Canada. The survey indicated that sales of farm tractors should number about 28,500 units, relatively unchanged from this year. However, large four-wheel-drive tractor sales are predicted to increase about 13 percent to 2,419 units. Small-size tractors have had a declining share of the tractor market for the past several years, and their share is expected to be 50 percent in 1976 compared with 76 percent in 1965. Sales of self-propelled combines are expected to be down slightly from this year's estimate of 4,000 units. Sales of conventional hay balers are expected to continue their downward trend of recent years to a level of about 6,000, due at least in part to the growing popularity of other types of haying equipment, and also due to the unfavorable beef-price outlook. In general, the CFIEI outlook for 1976 supports the forecast that the demand for farm machinery will weaken due to stabilizing farm cash receipts and declining realized net farm income.

One effect of the improved farm machinery supply will be the restoration of an element of price competition, at least at the dealer level, and this should serve to moderate further price increases. This is beginning to show in the United States as the U.S. Department of Agriculture noted in its September 1975 Agricultural Outlook Report that stocks of machines for sale are returning to normal levels and machinery prices, though continuing to increase, are rising at slower rates than those experienced in the previous 18 to 20 months.

Within the past year in Canada, most of the price increases for new machinery occurred at the beginning of the selling season. Statistics Canada price indexes show that prices advanced 4.9 percent between the fourth quarter of 1974 and the first quarter of 1975. The rate of price increase between the first and second quarters of 1975 was 0.9 percent. On the basis of this information, however, it is not possible to say with any degree of certainty if future price increases will be at a slower rate than has prevailed in the past 18 to 24 months. It appears that the machinery industry has reverted to its traditional practice of announcing price changes only once a year after the main selling season has ended, in contrast with 1974 when the major companies announced price increases on four occasions. Whatever the frequency of future increases, the extent of the increases will no doubt be affected by inflation through its impact on manufacturing and merchandizing costs. The new federal wage and price control policy announced in October 1975 will have some effect on future price increases for farm machinery, since Canadian farm machinery companies will be covered by the regulations concerning price increases.

Tractor and Implement Tires*

The situation in the tire market, both in Canada and the United States, is that large tractor tires are scarce and will remain so for this year and into 1976. The supply of smaller-size tractor tires and implement tires is about adequate. It is a catch-up situation, especially for the large-size tires.

Increased demand and short supply has been the case since 1973 and tire manufacturers have been running at full capacity.

With fewer farmers operating larger farms in Canada today and using more and bigger machinery to achieve greater productivity, there has been a greater demand for tires, especially the larger ones.

Canada's imports of tractor and implement tires increased 73 percent in 1974 over the previous year (Table 4). Tire imports for the first eight months of 1975 were up 12 percent over the same period in 1974. About 98 percent of these imports originated in the United States.

TABLE 4. – IMPORTS OF TRACTOR AND IMPLEMENT TIRES, 1968-1975

Year	Quantity	Value	Unit Price
	– number –	– dollars –	
1968	158,797	3,755,215	23.65
1969	168,536	4,371,068	25.93
1970	149,137	3,013,402	20.20
1971	161,592	4,707,394	29.13
1972	187,344	5,323,634	28.42
1973	203,326	6,871,503	33.79
1974	352,208	16,555,439	47.00
1974 1st 8 mos.	209,746	9,003,343	42.92
1975 1st 8 mos.	235,061	14,895,000	63.37

Source: Statistics Canada, Imports by Commodities, Cat. No. 65-007.

Prices were low until the boom began in 1973. The average unit price of tires rose about 39 percent in 1974 over 1973. Labor and material costs, as well as the unprecedented demand, were generally the basis given for the rise in prices. Prices in the first eight months of 1975 increased 48 percent over the same period in 1974.

The outlook for farm tires in 1976 is that supplies will be adequate except for the very large tires. It appears

*Information provided by V.A. Heighton is gratefully acknowledged.

that the larger the tires, the scarcer they become. The consensus on tire prices for 1976, based mainly on availability of supply, is for little change from 1975.

SUMMARY

Farm machinery in general should be more readily available in 1976 than in 1975. But supplies of larger equipment such as tractors of 80 horsepower and over are likely to remain tight throughout most of the year as demand continues to be relatively strong in this segment of the market, both in Canada and the United States. The over-all demand will weaken from 1975 levels, because of declining net farm incomes, which will rebuild inventories to more normal levels. Farmers should be prepared to pay higher prices for machinery in 1976, but price adjustments may not be as frequent as they were in 1974. Tire supplies, except for larger ones, will be adequate with prices showing little change from 1975.

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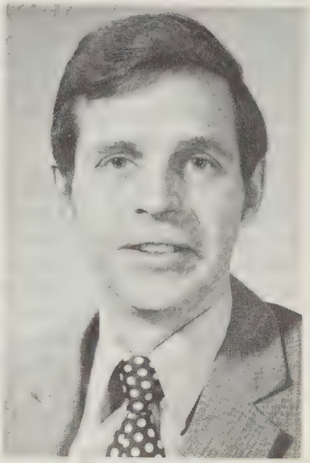
FERTILIZERS

Fertilizer supplies in 1975–76 are expected to increase over year-earlier levels and prices to ease from those of last spring. However, total fertilizer consumption may not increase much from a year ago.



*I.F. Furniss and C.D. Crober**

INTRODUCTION

Commercial fertilizers are an important input in Canadian agriculture. Expenditures by farmers in 1974 amounted to $339 million or 6.8 percent of total farm operating expenses. A decade earlier, fertilizer expenditures were $120 million, or 5.8 percent of the total. Expenditures for fertilizers in 1975 will be much larger than in 1974 due almost entirely to an average price increase of about 40 percent.

Most Canadian fertilizer manufacturing facilities are built to world-scale capacities. Hence, the supply and prices of fertilizers in Canada are influenced by North American and world conditions. In this paper, the world and Canadian fertilizer situation in 1974–75 will be reviewed and the demand, supply and price outlook for 1975-76 will be analyzed. In addition, fertilizer supply and use prospects for the period up to 1980-81 will be presented.

WORLD FERTILIZER SITUATION

World fertilizer production in 1975 increased 8.7 percent from the previous year's level to about 88 million tonnes[1] of nitrogen, phosphates and potash (NPK). However, sharply rising prices cut consumption in 1975 from previously predicted levels to 81 million tonnes. Demand pressures on a relatively fixed supply had pushed prices up three to four times over 1973 levels. World prices eased in early 1975 from 1974 levels but still represented an impediment to increased fertilizer consumption, especially in developing countries. These countries, many of which depend heavily on fertilizer imports and have limited foreign exchange reserves, built up stocks of fertilizers at 1974 prices. Consequently, difficulties are being experienced disposing of these stocks.

Since the last quarter of 1974, international fertilizer prices have declined and the differences between producing-country domestic and export prices have narrowed. By mid-1975 international prices were down sharply from their peaks. Urea, for example, declined from $350 or $360 a ton to $190 a ton in a single month, with spot prices dropping to $150 or $160.

Fertilizer consumption of primary nutrient materials and mixed fertilizers for a 14-state area of the U.S. in 1974-75 was 13 percent below the same period a year earlier[2]. Consumption of direct application materials

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[1] One metric tonne equals 1.1023 short tons (2,000 pounds) and one short ton equals 0.9072 tonnes. Unless otherwise specified, all figures are in nutrient, not total fertilizer product, terms.

[2] Based on reports submitted by State Fertilizer Control officials. Reports are not obtained from a number of important fertilizer-consuming regions including the cornbelt, the spring wheat area and West Coast states.

decreased 6 percent, while mixtures decreased 17 percent. The decline in fertilizer consumption in the United States has been attributed to the sharp price increase relative to crop price increases. One calculation indicates that 61 bushels of corn were needed to buy a ton of ammonia in 1970. In 1975, 104 bushels were required. To buy a ton of ammonia with 61 bushels in 1975, farmers would have needed a corn price of $4.55 instead of the $2.70 received.

The decline in U.S. demand for fertilizers in 1974-75 contributed to decreased Canadian exports of fertilizers and fertilizer materials to that country. Exports of fertilizer product to the U.S. in 1974-75 fell to 6.1 million tonnes, 13 percent below the 7.0 million tonnes in 1973-74. However, shipments to other countries increased from 2.5 million tonnes to 2.7 million in the same period. Total exports were down 7 percent.

WORLD FERTILIZER OUTLOOK

The world fertilizer outlook for 1975-76, both in terms of supplies and prices, is better than a year ago from a user viewpoint. Supplies of nitrogenous and phosphatic fertilizers will be larger this year. One reason for improved nitrogen supply is a short-term decline in non-agricultural demand, especially in the United States. While international fertilizer prices may decline further from the peak levels of 1974, they are not likely to fall to the extremely low levels of 1971-72 because of the considerably increased costs of raw materials, energy, labor, transportation and investment capital. World fertilizer capacity (capacity is not necessarily synonymous with production) in 1975-76 of the primary plant nutrients (NPK) is expected to increase from 1973-74 levels by 7.6 percent for nitrogen, 12.4 for phosphates and 3.3 percent for potash. However, consumption of nitrogen and phosphates is expected to increase at lesser rates of 6.3 percent and 5.2, respectively. Potash consumption is expected to grow by 5 percent.

In the shorter term, world ammonia capacity is expected to reach 88 million tonnes of NH_3 by 1977-78, almost 50 percent over 1973-74 capacity. Capacity in the United States will account for almost 24 percent of this total, Western Europe 19 percent, the U.S.S.R. 11 percent, and Canada 5 percent. Effective capacity for phosphate rock mining by 1977-78 should reach 154 million tonnes, 43 percent above 1973-74 capacity; by major producting countries, the U.S. will account for 38 percent of 1977-78 capacity and the U.S.S.R. and Morocco will each account for 18 percent. Canada does not have commercial phosphate rock mines. World potash production in 1977-78 is expected to be 29.3 million tonnes, one-third greater than 1973-74 production. Canada's share could be about 7.8 million tonnes, slightly more than present capacity, or 27 percent of world output by 1977-78. This compares with 26 percent for the U.S.S.R. and 11 percent for the United States. However, the U.S.S.R. and other eastern European countries are rapidly increasing their potash production and exports. The number of potash mining machines on order by the U.S.S.R. greatly exceeds the number on order by North American producers.

In the longer term, projections of the world fertilizer supply prepared by the FAO/UNIDO/World Bank Working Group on Fertilizers indicate that the very tight supply of the recent past is expected to become less severe and that supply prospects at least through 1980-81 are favorable because of firm and substantial commitments made for new capacity. Worldwide installed capacity for NPK is expected to reach 120 million tonnes by 1980-81.

In the United States, production of nitrogen is expected to increase in 1975-76 by 4 percent from 1974-75 output, while phosphate production may increase over 12 percent. Some U.S. industry spokesmen expect a 4 percent increase in fertilizer consumption while others expect none. Increased quantities of fertilizers, especially phosphatic fertilizers, will be available for export in 1975-76 to off-shore markets. Over-all 1975-76 U.S. fertilizer consumption may show little change from 1974-75, or may even decline. In the early part of the 1975-76 fertilizer year[3], consumption was down substantially from previous-year levels.

CANADIAN SITUATION

Fertilizer consumption in Canada in 1974-75 continued the upward trend established in 1970-71 and reached almost 3 million tons of product[4], 2.8 percent more than in 1973-74 (Table 1). All of the increased consumption was in Western Canada where product shipments increased by 6.5 percent compared with a decrease of about 1 percent in the East.

Since 1962-63, the long-term annual growth rate in fertilizer product consumption in Canada has been almost 6 percent. However, since nutrient content

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[3] July 1 to June 30.

[4] This estimate is based on the relative change in manufacturers' shipments to distributors. Hence, if dealer inventories at the end of the year increased by more than 2.8 percent, consumption on farms would have declined.

TABLE 1. CONSUMPTION OF FERTILIZERS (MIXTURES AND MATERIALS) SOLD IN CANADA, 1963 TO 1975 (YEARS ENDING JUNE 30)

Year or Period	Nitrogen (N)	Phosphate (P_2O_5)	Potash (K_2O)	Total Nutrients (NPK)	Total Product
			— thousand short tons —		
1963-67	204	312	141	657	1,681
1968-72	330	367	194	891	2,069
1973	452	458	210	1,120	2,492
1974	565	545	223	1,333	2,876
1975[a]	602	547	220	1,369	2,956
			— percent —		
Annual growth rates, 1963 to 1975[b]	12.1	5.8	5.7	8.0	5.9

[a]Unofficial estimates.
[b]Logarithmic regressions.

Source: Statistics Canada, The Fertilizer Trade, Cat. No. 46-207.

(concentration) has been increasing, from 36 percent of total product in 1962-63 to 46 percent in 1974-75 (2 percent a year), the total quantity of NPK consumed has increased proportionately more than the total product. The increase in NPK has been at a compound rate of 8 percent a year. Nitrogen consumption has increased the most rapidly since 1962-63 at 12 percent a year, followed by phosphate at 5.8 percent and potash at 5.7 percent.

The slowdown in the growth of fertilizer consumption in 1974-75, compared with the increases recorded in the previous two years, was attributable primarily to two factors: first, the sharp increase in fertilizer prices, up almost 40 percent over year-earlier levels, and second, a weakening of grain prices. For example, in 1974-75, it took about 38 bushels of wheat to pay for a ton of 11-48-0 fertilizer, 4 bushels more than in 1973-74 and 7 bushels above 1972-73 requirements. The relationship of ammonia prices to corn prices was much less favorable, however, in 1974-75, when about 106 bushels of corn were required to pay for a ton of anhydrous ammonia. Only 66 bushels were required in 1973-74.

On a regional basis, fertilizer price increases between the spring of 1975 and the previous spring were relatively similar in Eastern and Western Canada (Table 2). This was a change from the previous year when prices increased more sharply in the East, 36 percent, compared with 17 percent in the West, because of the relatively tighter nitrogen supply situation in Eastern Canada. Prices of materials such as ammonium nitrate increased about 40 percent in 1974-75 in both Eastern and Western Canada but mixed fertilizer prices increased 39 percent in the East and 32 percent in the West.

On an international basis, there was a significant differential in U.S.–Canada fertilizer prices a year ago, especially in Western Canada. This resulted in some domestically-committed supplies being rerouted to U.S. consumers. The Canada-U.S. price differential narrowed throughout 1975 because of weaker U.S. demand and, at mid-fertilizer year, had reached the point where some U.S. spot prices were lower than Canadian prices. Fertilizer prices in the spring of 1975 in the United States averaged 33 percent higher than year-earlier spring prices. This compares with an increase of 71 percent (annual averages) from 1973 to 1974.

Fertilizer supplies available for Canadian consumption in 1974-75 were generally more than adequate. With the increase in domestic supplies exceeding the increase in consumption, reduced levels of exports and no significant labor disputes, stocks built up so that inventories at the beginning of the 1975-76 year are considerably above year-earlier levels. While most of the inventory comprises potash, the increase in phosphates represents a significant proportion of Canadian production.

CANADIAN OUTLOOK

Nitrogen

Eleven producers operate plants at 16 locations for the production of basic nitrogen and phosphatic fertilizer materials. These plants have an estimated annual produc-

TABLE 2. INDEXES OF FERTILIZER PRICES, CANADA, SECOND QUARTERS, 1970 TO 1975 (1961=100)

	Eastern Canada		Western Canada		All Canada	
Item and Year	Index	Percentage Change	Index	Percentage Change	Index	Percentage Change
Fertilizers						
1971	102.7	–	101.3	–	102.3	–
1972	103.3	0.6	111.0	9.6	105.3	2.9
1973	112.2	8.6	117.5	5.9	113.6	7.9
1974	152.8	36.2	137.9	17.4	148.9	31.1
1975	212.7	39.2	192.9	39.9	207.5	39.4
Materials						
1971	98.4	–	101.2	–	100.4	–
1972	98.3	−0.1	111.3	10.0	107.4	7.0
1973	103.1	4.9	118.3	6.3	113.7	5.9
1974	166.7	61.7	138.3	16.9	146.8	29.1
1975	234.1	40.4	194.4	40.6	206.3	40.5
Mixtures						
1971	103.4	–	102.5	–	103.4	–
1972	104.2	0.8	107.4	4.8	104.3	0.9
1973	113.6	9.0	109.3	1.8	113.4	8.7
1974	150.5	32.5	133.9	22.5	149.9	32.2
1975	209.2	39.0	177.3	32.4	208.1	38.8

Source: Statistics Canada, Farm Input Price Index, Cat. No. 62-004.

tion capacity for nitrogen in 1975-76 of one and a third million tons. The Canadian Fertilizers Limited plant under construction at Medicine Hat, Alberta, will not come into production in time to add to the spring 1976 nitrogen supply but will begin operations later in the year. This plant, owned by Canadian and U.S. farmer supply co-operatives, will have a daily capacity of 1,200 tons of ammonia, plus 1,500 tons of urea. Canadian Fertilizers Limited has obtained final Alberta Government approval to build one more plant, with a daily capacity of 1,200 tons of ammonia, to be ready by early 1977. Cominco Limited has an ammonia and urea production plant under construction at Calgary for completion in 1977 with a daily capacity of 1,200 tons of ammonia. The plant of Becker Industries Limited at Sarnia, Ontario, with a rated annual output of 130,000 tons of ammonia, did not come on stream as early as expected but is now fully operational. With the generally weak pulp and paper and lumber (plywood) markets, supplies available for agriculture should be adequate although there may be some regional shortages[5]. By 1977-78, Canadian ammonia capacity will total 2.5 million tons.

The long-term growth of nitrogen use by Canadian farmers has averaged 12.1 percent a year since 1962-63. Continuation of this trend would mean a Canadian agricultural consumption of 1 million tons by 1979-80. This forecast is at the upper limit of most current consumption forecasts. Realization will depend upon more favorable crop/nitrogen price relationships prevailing than was the case in 1974-75. The 6.5 percent consumption increase in that year was below the long-term trend.

Phosphates

Canadian production capacity for phosphates in 1975-76 continues unchanged at about 1 million tons annually. The Canadian manufacturing industry depends entirely on imports of phosphate rock from the United States which, in 1974-75, totalled almost 4 million tons compared with 3.7 million a year earlier. While the increase in tonnage was only about 8 percent, average unit declared values increased by two and a quarter times in the one-year period. Considerable quantities of phosphatic fertilizers also are imported into Eastern Canada, again principally from the United States. In 1974-75, imports totalled 107,000 tons, 32 percent above 1973-74 levels.

There has been a significant increase in phosphatic fertilizer capacity in the United States in recent years. In

[5] The pulp and paper and lumber manufacturing industries are important users of ammonia and urea. Normally 20 to 25 percent of ammonia production goes into non-fertilizer uses.

1974, capacity was 6.7 million tons and it is scheduled to exceed 8.7 million tons by the end of 1975. Surplus phosphate supply in the United States under "medium use" levels is currently forecast at 1.4 million tons (assuming constant net exports). This over-supply will have a price-dampening effect in the North American market in 1976.

Consumption of phosphates in Canada has grown at a rate of 5.8 percent a year since 1962-63. However, growth in 1974-75 was less than 1 percent compared with 19 percent in the previous year. Extending this long-term trend suggests consumption of 725,000 tons by 1979-80. Estimates of 1980 consumption levels are as high as 800,000 tons, while others are below 700,000 tons. However, the rate of increase between 1975 and 1980 is expected to be somewhat higher in Western Canada than in the East because of an anticipated continuing increase in cropped land in the West. Current economic conditions favor increasing imports of phosphatic fertilizers rather than increasing domestic capacity, especially to supply the Eastern Canadian market.

Potash

Canadian potash production capacity in 1975-76 remains unchanged at a rated 8.3 million tons. Actual capacity, however, is about 86 percent of this or 7.2 million tons. Production in 1974-75 was about 6 million tons. Several companies had announced plans for increasing potash production capacity but now have deferred these plans pending the outcome of the Saskatchewan "potash reserves" provincial tax question and appeals launched against it by potash producers. Then on November 13, 1975, the Government of Saskatchewan announced its intention to acquire ownership of some or all of the producing potash mines in the province.

The potash consumption trend since 1962-63 has been about the same as for phosphates at 5.7 percent a year. However, 1974-75 Canadian potash consumption dropped 1.2 percent. The growth rates in the two previous years were also below the long-term trend, amounting to only 1 and 2 percent a year. Assuming growth rates of 2.0 and 5.7 percent a year to 1979-80 from a 1974-75 consumption of 220,000 tons would put total potash consumption at between 240,000 and 290,000 tons. Other projections have estimated 1979-80 consumption at 330,000 to 360,000 tons. Regardless of the figure used, Canadian consumption in 1979-80 would still be no more than 5 percent of current capacity. Hence, exports, especially to the United States, are of vital importance to Canadian potash producers.

Prices

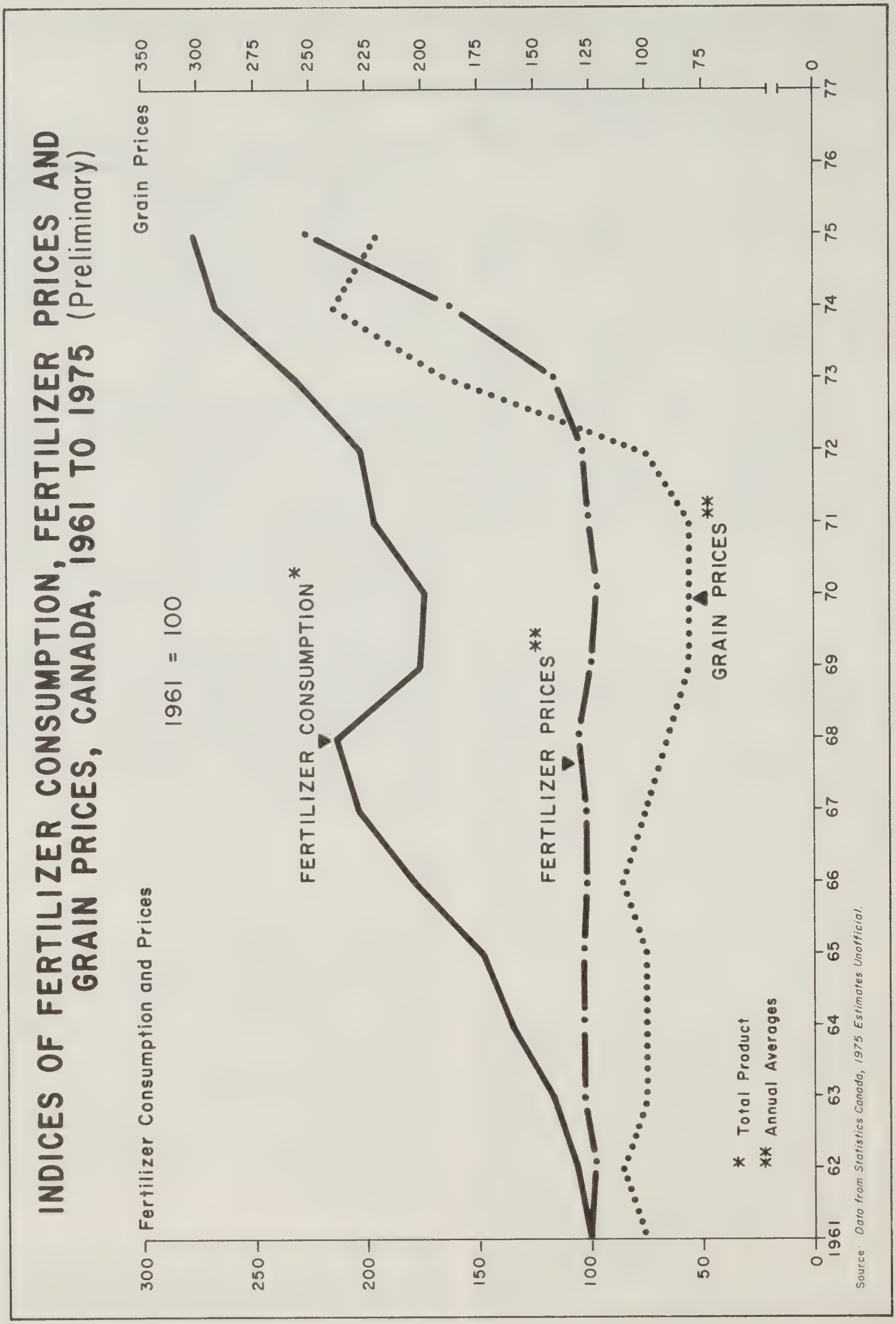
Fertilizer industry sources have indicated that domestic consumption is expected to be 6 to 8 percent higher in 1975-76 than in the previous year. Exports to the United States are expected to increase by a like amount. Canadian absorption of this supply increase at current prices will depend on fertilizer-crop-price relationships expected in 1976, especially in Western Canada. Figure 1 illustrates the long-term trends that have occurred in fertilizer prices and grain prices.

The improved supply situation for fertilizers and the expected weakening of grain prices seem likely to reduce fertilizer prices below spring 1975 prices throughout the balance of the 1975-76 fertilizer year. Also, unless grain price prospects improve relative to current fertilizer prices, total Canadian consumption in 1975-76 will likely be about the same as in 1974-75 with perhaps a small increase. Fertilizer manufacturers and distributors in some areas of the country are offering cash discounts or other incentives for winter delivery to reduce inventories and free storage space. This represents a return to a more normal marketing situation and could mean a reduction in average fertilizer prices to producers with possibly increased consumption. Early ordering of fertilizer supplies could also ensure more orderly deliveries should transportation difficulties develop later in the season. Some provincial governments are actively encouraging farmers to do this.

SUMMARY

World fertilizer supplies improved in 1975 and prices eased from their record level of 1974. However, current price levels still represent an impediment to increased fertilizer consumption, especially in developing countries. While international prices may decline further, they are not likely to return to 1971-72 levels because of considerably increased costs of raw materials, energy, labor, transportation and investment capital. World fertilizer capacity in 1975-76 is expected to increase proportionately more than consumption in the case of nitrogen and phosphates but the opposite is likely to occur for potash.

Fertilizer use in Canada in 1974-75, on the basis of shipments to distributors, increased over the previous year's level by less than 3 percent. Two principal factors contributed to this small increase: first, an increase of


INDICES OF FERTILIZER CONSUMPTION, FERTILIZER PRICES AND GRAIN PRICES, CANADA, 1961 TO 1975 (Preliminary)
1961 = 100
Fertilizer Consumption and Prices
Grain Prices
FERTILIZER CONSUMPTION*
FERTILIZER PRICES**
GRAIN PRICES**
* Total Product
** Annual Averages
0
50
100
150
200
250
300
75
125
175
225
275
350
1961
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
Source: Data from Statistics Canada, 1975 Estimates Unofficial.
Figure 1

almost 40 percent in fertilizer prices and, second a weakening of grain prices.

Fertilizer supplies for domestic consumption in 1975-76 are expected to increase, partly due to increased inventories at the beginning of the year. Fertilizer prices are expected to be somewhat lower than last spring's throughout the balance of the 1975-76 fertilizer year. At current grain price prospects, total fertilizer consumption will probably be about the same as in 1974-75 or slightly higher.

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FARM FINANCE

*R.S. Rust**

Total credit extended to farmers in 1975 probably ranged between $4,300 and $4,600 million, and farm debt totalled between $7,300 and $7,500 million. The amount of long- and intermediate-term credit in 1976 is expected to be similar to 1975 but short-term credit is expected to increase by at least $400 or $500 million. Interest rates are expected to remain close to the high levels of 1975 and FCC rates are expected to increase.

SITUATION

The demand for western grain and grain prices are the two major factors that have traditionally had the greatest effect on the amount of credit used by Canadian farmers during any specific period. The total net farm income of Canadian farmers in 1974 was over 80 percent higher than in 1972. This increase was accompanied by a 49-percent increase in the use of credit .The increase in net farm income and the amount of credit used was greater in 1974 than in 1973.

Credit in the United States

In the United States there was a very large increase in farm incomes in 1973, accompanied by an increase of $8.7 billion in farm debt or 12 percent greater than in 1972. Farm incomes were lower in 1974 and farm debt increased $7.7 billion making the total farm debt at the end of the year $81.5 billion of which $46.3 billion was farm real estate debt and $35.2 billion non-real estate debt. In 1973 there was an increase in farm debt of 12 percent that was accompanied by a 25-percent increase in the total value of farm assets. As a consequence, the farm debt-to-asset ratio decreased from 19.6 percent at the end of 1972 to 17.6 percent at the end of 1973. The trend continued in 1974. The debt-to-asset ratio of farm real estate for 1974 was 12.5 percent compared with 12.7 percent a year earlier. The non-real estate debt-to-asset ratio was 23.9 percent for 1974 compared with 21.8 percent at the end of 1973. Proprietors' equity in farm assets increased from $401.8 billion in 1973 to $438.4 billion in 1974, a gain of $36.6 billion. The increase a year earlier was $82.5 billion. The increase in the value of real estate was much less in 1974, and was accompanied by a $17.8 billion decline in the value of livestock and poultry on farms.

Farm real estate purchases in the United States decreased in 1974. Interest rates on non-real estate loans from Production Credit Associations increased to about 10 percent and to about 9 percent for mid-western banks. Large commercial bank rates to farmers peaked at about 10.75 percent. The Farmers Home Administration rates averaged 7.6 percent in 1974 while Federal Land Bank loans increased to 8.5 percent at the end of the year. However, in addition to interest payments Production Credit Associations and Federal Land Banks require borrowers to purchase stock in the co-operatives. These forced purchases usually amount to about 5 percent of each loan. Interest rates on loans from life insurance companies increased to over 10 percent in 1974, but because of long-established state usury laws, some companies had to withdraw from the lending field.

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Farm Credit in Canada, 1964 to 1974

During the 5-year period 1964-68 the total credit extended to Canadian farmers increased from $1,642 million to $2,177 million or 71 percent (Table 1). Long-term credit extended (over 10 years) increased by 41 percent, intermediate-term (18 months to 10 years) increased steadily up to and including 1967, but dropped sharply in 1968 resulting in a 12-percent decrease for that period. Short-term loans increased by 46 percent. In 1964, the total debt of farmers was $2,613 million and represented 14.9 percent of their total investment. By 1968 total farm debt was $4,105 million, an increase of 57 percent over the period, and represented 16.3 percent of the total farm investment. Long-term debt was $903 million in 1964 and $1,713 million in 1968, an increase of 90 percent. Intermediate-term debt increased 30 percent from $883 million in 1964 to $1,148 million in 1968; however, in 1967 it had reached a high of $1,301 million. Short-term debt was $828 million in 1964 and $1,244 million in 1968, an increase of 50 percent. From 1964 to 1967 total short-term farm debt was lower than intermediate-term debt, but has been consistently greater since that time.

In the first three years of the 1969-73 period, low returns from grain sales were received and the length of intermediate and short-term loans were generally of shorter duration than in previous years. With prospects for a growing demand for grain in 1972 and even stronger demand in 1973 accompanied by greatly increased prices for most agricultural products, both the demand for and the supply of credit increased. In 1969, $2,169 million was extended in credit compared with $3,713 million in 1973, an increase of 71 percent. Long-term credit increased 88 percent from $246 million in 1969 to $462 million in 1973. Intermediate-term credit extended was $415 million in 1969, but was nearly $841 million in 1974, an increase of over 102 percent. Short-term credit extended increased by 60 percent from $1,508 million in 1969 to $2,410 million in 1973.

TABLE 1. AMOUNT OF FARM CREDIT EXTENDED AND OUTSTANDING TOTAL AND SUBTOTALS BY LENGTH OF TERM AND PERCENT CHANGE BY PERIODS, CANADA, 1964-73 AND PRELIMINARY 1974

Year	Total extended	Long term	Intermediate term	Short term	Total outstanding	Long term	Intermediate term	Short term
				– millions of dollars –				
1964	1641.7	224.4	354.3	1063.0	2613.3	902.7	882.8	827.8
1965	1862.8	292.6	435.7	1134.5	3004.4	1098.8	1029.0	885.6
1966	2021.7	344.2	476.4	1201.1	3444.2	1327.5	1147.7	946.9
1967	2270.0	378.5	503.1	1388.4	3950.7	1560.1	1300.8	1089.8
1968	2177.2	316.8	311.9	1548.5	4104.8	1713.4	1147.7	1243.7
				– percent change –				
1964 to 1968	32.6	41.2	–12.0	45.7	57.1	89.8	30.0	50.2
				– millions of dollars –				
1969	2168.9	245.7	415.5	1507.7	4424.8	1796.2	1210.9	1417.7
1970	2239.5	196.8	420.2	1622.5	4480.7	1854.3	1179.7	1446.7
1971	2640.7	206.0	528.4	1906.3	4714.3	1875.9	1249.5	1588.9
1972	2975.8	231.9	701.3	2042.6	5085.2	1917.6	1431.7	1735.9
1973	3712.8	461.8	840.6	2409.6	5861.9	2132.4	1807.7	1921.8
				– percent change –				
1969 to 1973	71.2	88.0	102.3	59.8	32.5	18.7	49.3	35.6
				– millions of dollars –				
Preliminary 1974	4441.1	635.8	917.4	2887.9	6741.2	2463.3	1967.7	2310.2
				– percent change –				
1973 to 1974	19.6	37.7	9.1	19.8	15.0	15.5	8.8	20.2

The total farm debt in 1969 was $4,425 million and represented 16.9 percent of total farm assets. By 1973 total debt had increased to $5,862 million and represented 17.9 percent of total farm investment. Long-term debt, which had amounted to $1,796 million in 1969 increased to $2,132 million in 1973, a gain of nearly 19 percent. Intermediate-term debt increased by 49 percent from $1,211 million to $1,808 million. Short-term debt amounted to $1,418 million in 1969 and $1,922 million in 1973, an increase of nearly 36 percent (Table 1).

Credit Extended in 1973 and 1974

Preliminary estimates indicate that $4,441 million in credit was extended to farmers in 1974 and represented a 19.6 percent increase over the amount extended in 1973 (Table 2). However, long-term loans increased by

TABLE 2. ESTIMATED FARM CREDIT EXTENDED, CANADA, 1971 TO 1974

Source and term of credit	Estimated farm credit extended 1971	1972	1973	1974*	Estimated average interest rate 1972	1973	1974*	Percent of credit extended by source 1973	1974*
	— millions of dollars —				— percent —			— percent —	
LONG-TERM (more than 10 years)									
Farm Credit Corporation	109.7	156.0	333.2	430.9	6.7	6.8	7.9	9.0	9.7
Veterans' Land Act	20.6	11.4	12.4	11.7	6.7	6.7	7.3	0.3	0.3
Provincial government agencies	47.2	36.9	91.2	163.7	6.2	6.2	5.6	2.5	3.6
Private individuals	22.0	17.0	19.0	22.0	7.0	7.5	8.5	0.5	0.5
Insurance, trust and loan companies	3.0	5.0	4.0	4.0	10.5	13.0	13.5	0.1	0.1
Treasury Branches (Alberta)	1.7	3.7	—[a]	—	—	—	—	—	—
Alberta Electrical Co-operatives	1.8	1.9	2.0	3.5	3.5	3.5	3.5	0.1	0.1
Total long-term	206.0	231.9	461.8	635.8	6.8	6.7	7.3	12.5	14.3
INTERMEDIATE-TERM (18 months to 10 years)									
Banks (FILA)	147.4	177.9	223.8	160.0	6.6	6.5	9.1	6.0	3.6
Banks (other than FILA)[b]	55.0	65.0	116.0	232.0	8.4	11.5	11.8	3.1	5.2
Private individuals	146.0	151.0	174.0	210.0	6.7	9.5	8.5	4.7	4.7
Supply companies	51.0	144.3	125.4	102.0	14.9	14.9	15.5	3.4	2.3
FCC (loans to farm syndicates)	1.9	1.9	4.4	5.3	6.2	6.3	8.5	0.1	0.1
Insurance, trust and loan companies	10.0	27.0	26.0	23.0	10.5	12.5	13.5	0.7	0.5
Federal Business Development Bank[c]	11.4	16.5	22.7	37.9	9.5	9.7	12.5	0.6	0.9
Credit Unions	82.4	90.1	98.3	99.7	9.0	9.9	11.8	2.7	2.3
Municipalities (Ontario Tile Drain Act)	5.9	4.7	8.0	12.5	4.0	4.0	4.0	0.2	0.3
Finance companies (cars and trucks)	13.0	16.0	12.0	18.0	11.0	13.0	14.0	0.3	0.4
Treasury Branches (Alberta)	4.4	6.9	30.0	17.0	8.2	11.0	11.4	0.8	0.4
Total intermediate-term	528.4	701.3	840.6	917.4	9.1	10.0	11.0	22.6	20.7
SHORT-TERM (up to 18 months)									
Banks (other than FILA)	1314.0	1404.0	1756.0	2065.0	7.8	10.8	11.8	47.3	46.5
Supply companies	275.0	269.2	216.0	295.0	11.0	15.0	15.5	5.8	6.6
Credit Unions	134.4	163.6	211.5	242.5	9.2	10.7	12.0	5.7	5.5
Finance companies (household & personal)	12.0	14.0	16.0	17.0	16.0	19.0	20.0	0.4	0.4
Dealers, stores, etc.	10.0	10.0	12.0	16.0	14.0	15.0	15.0	0.3	0.4
Private individuals	105.0	104.0	114.0	135.0	7.0	8.5	8.5	3.1	3.0
Treasury Branches (Alberta)	24.7	27.4	39.6	65.4	7.0	10.4	11.3	1.1	1.5
Provincial, Agencies[d]	1.2	1.3	0.5	1.8	8.4	9.3	10.0	—	—
Co-operative programs	30.0	49.1	44.0	50.2	10.4	10.3	15.2	1.2	1.1
Total short-term	1906.3	2042.6	2409.6	2887.9	8.4	11.1	12.2	64.9	65.0
Total all credit	2640.7	2975.8	3712.0	4441.1	8.5	10.3	11.2	100.0	100.0

*Preliminary.

[a] Long-term credit discontinued in 1973 and directed to a provincial credit agency.
[b] Does not include FILA loans from credit unions or Alberta Treasury Branches.
[c] Formerly Industrial Development Bank.
[d] Up to 1972 represented only Sedco (Saskatchewan); starting in 1973, includes small amount of credit from provincial sources.

nearly 38 percent compared with just over 9 percent on intermediate-term loans, and slightly less than 20 percent on short-term loans. Increased farm product prices together with relatively low interest rates on long-term credit increased the demand for loans and resulted in an increase in farm land values. Based on an index of farm land values (1961=100) the national increase in value was 17 percent from 1972 to 1973, and 27 percent from 1973 to 1974. The index numbers for 1974, by province, with percentage increases given in brackets are British Columbia 321 (40 percent), Ontario 403 (30 percent), Prince Edward Island 251 (29 percent), Nova Scotia 221 (28 percent), Manitoba 224 (27 percent), Saskatchewan 270 (25 percent), New Brunswick 227 (25 percent), Alberta 257 (24 percent), and Quebec 206 (15 percent). Long-term extended by the Farm Credit Corporation (FCC) increased from $156 million in 1972 to $333 million in 1973 and to $431 million in 1974. The FCC provided 9.8 percent of the total credit extended to farmers in 1974, but held 67.9 percent of the long-term debt. The total amount of credit extended by provincial farm credit agencies increased from $91.2 million in 1973 to $163.7 million in 1974, an increase of 44 percent. Loan amounts from other sources in 1974 did not change greatly from those of previous years. The total amount of long-term loans was $635.8 million or 14.3 percent of the total credit extended.

The intermediate-term credit extended was $701 million in 1972, $841 million in 1973, and $917 million in 1974. Loans under the Farm Improvement Loans Act (FILA) decreased sharply during the latter part of 1974, but the actual amount for the year has not as yet been published. Other intermediate-term loans from banks increased, but published statistics from bank sources are not available. As a consequence, data presented are preliminary estimates. Private individuals (mostly retired farmers) continued to increase the amount of credit they extended in 1974. Intermediate-term loans from insurance, loan and trust companies decreased slightly in 1974. However, the federal Business Development Bank (formerly the Industrial Development Bank), which extended $22.7 million in agricultural loans in 1973, is believed to have increased farm loans by nearly 70 percent in 1974, an estimated $38 million. Mortgage loans from credit unions to farmers are mostly intermediate-term. They amounted to almost $100 million in 1974, practically unchanged from a year earlier. While Alberta Treasury Branches have decreased their intermediate credit activity from $30 million in 1973 to $17 million in 1974, about $10 million of the $30 million in 1973 represented loans that were not clearly defined as to length of term. As a result of a policy change in 1974 requests for long-term farm loans from Alberta Treasury Branches were transferred to the Alberta Agricultural Development Corporation. Supply company intermediate-term credit declined by an estimated $23 million in 1974 from the 1973 level. In 1974 intermediate-term credit represented 20.7 percent compared with 22.6 percent of total credit extended a year earlier.

Every listed source of short-term agricultural credit increased its credit activity with farmers in 1974, although within sources some cutbacks were reported. The chartered banks are estimated to have extended $1,404 million in 1972, $1,756 million in 1973 and $2,065 million in 1974 in short-term credit. These amounts are based primarily on the outstanding farm debt on bank accounts and on reports concerning average length of bank loans. Supply company credit, which was estimated to have decreased to $216 million in 1973 from $269 million a year earlier, increased to an estimated $295 million in 1974. Alberta Treasury Branch short-term loans increased from $40 million in 1973 to $65 million in 1974. The total short-term credit extended in 1972 was $2,043 million. In 1973 and 1974 the totals increased to $2,410 and $2,888 million, respectively, and represented 65 percent of total credit in both years.

Credit Outstanding in 1973 and 1974

The total amount of farm credit outstanding increased from $5,085 million in 1972 to $5,862 million in 1973 and to $6,741 million in 1974 (Table 3). The distribution of farm debt by length of term in 1974 was 36.5 percent long-term, 29.2 percent intermediate-term, and 34.3 percent short-term, nearly the same distribution as in 1973. Long-term FCC loans increased from $1,444 million in 1973 to $1,685 million in 1974, and in the latter year represented 25 percent of total farm debt. Farm indebtedness to provincial farm credit agencies increased from over $415 million in 1973 to $517 million in 1974, and represented 7.7 percent of the total debt of farmers. Farm indebtedness to other long-term sources was only $261 million or 3.8 percent of all farm debt.

The amount outstanding on intermediate-term accounts increased from $1,432 million in 1972 to $1,808 million and $1,968 million in 1973 and 1974, respectively. While loans extended by chartered banks under FILA decreased by an estimated $64 million in 1974, the estimated amount outstanding was nearly identical to that of the previous year. The total intermediate-term farm debt to chartered banks is estimated to have been $492 million in 1973 and $607 million or 9 percent of

TABLE 3. ESTIMATED FARM CREDIT OUTSTANDING, CANADA, 1971 TO 1974

Source and term of Credit	Estimated farm credit outstanding 1971	1972	1973	1974*	Estimated average interest rate 1972	1973	1974*	Estimated average interest charges 1973	1974*	Percent of credit outstanding by source 1973	1974*
	— millions of dollars —				— percent —			— millions of dollars —		— percent —	
LONG-TERM (more than 10 years)											
Farm Credit Corporation	1182.5	1229.1	1443.7	1684.6	6.0	6.2	6.6	79.54	97.65	24.7	25.0
Veterans' Land Act	151.5	147.2	142.0	133.8	6.0	6.1	6.4	8.66	8.56	2.4	2.0
Provincial Government agencies	395.7	404.6	415.5	517.3	4.6	4.7	4.9	21.19	25.35	7.1	7.7
Private individuals	80.0	72.0	83.0	84.0	6.0	6.3	6.7	5.23	5.63	1.4	1.2
Insurance, trust, and loan companies	49.0	46.0	35.0	29.0	9.3	10.1	10.4	3.54	3.02	0.6	0.4
Treasury Branches (Alberta)	3.1	5.0	—[a]	—	9.0	—	—	—	—	—	—
Alberta Electrical Co-operatives	14.1	13.7	13.2	14.6	3.5	3.5	3.5	0.46	0.51	0.2	0.2
Total long-term	1875.9	1917.6	2132.4	2463.3	5.7	5.6	5.7	118.62	140.72	36.4	36.5
INTERMEDIATE-TERM (18 months to 10 years)											
Banks (FILA)	321.0	374.0	446.1	447.0	7.3	7.2	8.0	32.12	35.76	7.6	6.6
Banks (other than FILA)	50.0	80.0	146.4	160.0	8.2	10.6	11.3	15.52	18.08	2.5	2.4
Private individuals	540.0	547.0	629.0	643.0	6.4	6.9	7.3	43.40	46.94	10.7	9.5
Supply companies	130.0	185.2	145.7	129.0	14.9	14.9	15.2	21.71	19.61	2.5	1.9
FCC (loans to farm syndicates)	6.8	6.7	7.8	11.1	7.4	6.9	7.3	0.47	0.67	0.1	0.2
Insurance, trust and loan companies	15.0	32.7	51.1	49.0	9.6	11.2	13.0	5.72	6.37	0.9	0.7
Federal Business Development Bank[c]	34.0	42.0	50.0	70.0	9.2	9.4	10.6	4.70	7.42	0.9	1.0
Credit Unions	104.0	110.0	251.6	355.4	9.3	9.9	10.6	24.91	37.67	4.3	5.3
Municipalities (Ontario Tile Drain Act)	22.8	24.4	29.2	37.6	4.0	4.0	0.4	1.17	0.15	0.5	0.6
Finance companies (cars and trucks)	21.0	23.0	18.0	25.0	11.5	13.2	14.2	2.38	3.55	0.3	0.4
Treasury Branches (Alberta)	4.9	6.7	32.8	40.6	8.2	10.6	10.7	3.48	4.34	0.6	0.6
Total intermediate-term	1249.5	1431.7	1807.7	1967.7	8.3	8.7	9.2	155.58	180.56	30.9	29.2
SHORT-TERM (up to 18 months)											
Banks (other than FILA)	1006.9	1116.0	1403.5	1678.0	7.8	10.5	11.0	147.37	184.58	24.0	24.9
Supply companies	220.0	185.2	137.0	189.0	12.0	14.0	15.5	19.18	29.30	2.3	2.8
Credit Unions	204.0	259.0	189.3	218.4	9.2	10.7	11.7	20.26	25.55	3.2	3.3
Finance companies (household & personal)	10.0	12.0	8.0	7.0	18.0	19.0	20.0	1.52	1.40	0.1	0.1
Dealers, stores, etc.	6.0	8.5	6.0	8.0	15.0	15.0	15.0	0.90	1.20	0.1	0.1
Private individuals	90.0	86.0	95.0	109.0	7.5	8.0	8.4	7.60	9.16	1.6	1.6
Treasury Branches (Alberta)	23.2	28.4	52.7	71.4	7.0	10.0	10.0	5.27	7.14	0.9	1.1
Provincial agencies[d]	6.8	2.8	3.0	7.3	8.4	9.0	9.0	0.27	0.66	0.1	0.1
Co-operative programs	16.0	30.4	20.0	14.2	10.6	10.7	12.8	2.14	1.82	0.3	0.2
Unpaid taxes	6.0	7.6	7.3	7.9	6.0	9.9	10.5	0.72	0.83	0.1	0.1
Total short-term	1588.9	1735.9	1921.8	2310.2	8.6	10.7	11.3	205.23	261.64	32.7	34.3
Total all credit	4714.3	5085.2	5861.9	6741.2	7.4	8.2	8.6	479.43	582.92	100.0	100.0

*Preliminary

[a]Long-term credit discontinued in 1973 and directed to provincial credit agency.
[b]Does not include FILA loans through credit unions or Alberta Treasury Branches.
[c]Formerly Industrial Development Bank.
[d]Up to 1972 represented only Sedco (Saskatchewan); starting in 1973, includes small amount of credit from provincial sources.

total debt in 1974. Farm debt to private individuals, as a result of intermediate-term loans, increased from an estimated $629 million in 1973 to $643 million in 1974. Both estimates are considered conservative in view of the increases in land values.

In 1972 the amount of short-term credit outstanding was estimated at $1,736 million. By the end of 1973 and 1974 the amount of such indebtedness increased to $1,922 and $2,310 million, respectively. While the latter amount represented over 34 percent of total farm debt, 25 percent of this total was on the short-term accounts of chartered banks. Short-term indebtedness to credit unions increased to $218 million in 1974 from $189 million in 1973. However, the 1974 amount was considerably below the $259 million outstanding in 1972. The debt to Alberta Treasury Branches on short-term accounts increased from $28 million in 1972 to $53 million and $71 million in 1973 and 1974, respectively.

Bank loans to farmers have increased greatly in recent years and have resulted in a faster growth in short-term than in intermediate-term debt. Bank loans outstanding (including FILA) are estimated at $2,285 million in this report and differ by $10 million from that reported by banks since FILA accounts of banks, credit unions and Alberta Treasury Branches are accounted for in tables 2 and 3. The total debt of farmers to banks of $2,295 million, for the fourth quarter of 1974, was distributed approximately as follows: British Columbia 6 percent, Alberta 29 percent, Saskatchewan 19 percent, Manitoba 8 percent, Ontario 30 percent, Quebec 5 percent, New Brunswick, Nova Scotia and Prince Edward Island less than 1 percent each (Table 4).

Ratio of Farm Debt to Farm Investment

In 1969 and 1970 the ratio of farm debt to total estimated farm investment was 16.9 percent. The ratio increased to 17.8 percent in 1971 and to 18.2 percent in 1972. With the rapid increase in the value of farm real estate in 1973 and 1974, the ratio decreased to 17.9 and 16.8 percent respectively. If only investment in real estate, machinery and livestock is considered, the ratios for the above years are roughly two percent higher (Table 5).

Interest Rates

Prime business loan rates of chartered banks that remained at 6 percent throughout 1972 and the first quarter of 1973, increased to 6.5 percent in April, gradually increased to 9 percent in September and increased again in December to 9.5 percent. This rate was maintained in 1974 until April when it increased to 10.5 percent. In May and June the rate was 11 percent, but it again increased in July to 11.5 percent and finally dropped back to 11 percent in November. In 1975 the rate decreased to 10.5 percent in January and then to 9 percent in February, then increased in September to 9.75 percent (Table 6).

In many provinces an increasing amount of credit is being extended by banks to farmers under various provincial guarantees. These guarantees range up to 100

TABLE 4. AMOUNT AND PERCENT OF TOTAL OUTSTANDING ON FARM ACCOUNTS OF CHARTERED BANKS[a] BY PROVINCE, DECEMBER 1973 AND 1974, AND MARCH 1974 AND 1975[a]

Province	Amount Outstanding December 1973	Amount Outstanding December 1974	Percent by province 1974	Amount outstanding March 1974	Amount outstanding March 1975
	— millions of dollars —		— percent —	— millions of dollars —	
British Columbia	94	137	5.97	104	146
Alberta	563	669	29.15	583	629
Saskatchewan	397	445	19.39	387	392
Manitoba	179	195	8.50	164	189
Ontario	630	689	30.02	583	644
Quebec	96	106	4.62	97	106
New Brunswick	15	18	.78	13	17
Nova Scotia	13	16	.70	12	15
Prince Edward Island	16	19	.83	14	18
Newfoundland	2	1	.04	1	1
Total	2,005	2,295	100.0	1,958	2,157

[a]Bank of Canada Review, various issues. Includes FILA but not personal loans to farmers.

TABLE 5. THE RATIO OF FARM DEBT TO FARM INVESTMENT, CANADA 1964 TO 1974

Year	Farm debt	Investment in farm real estate, machinery and livestock[a]	Debt in relation to real estate machinery, and livestock investment	Estimated total investment of farmers[b]	Debt in relation to total investment
	— millions of dollars —		— percent —	— millions of dollars —	— percent —
1960	1,583.0	12,680.0	12.5	14,088.9	11.2
1961	1,785.1	13,159.2	13.6	14,621.3	12.2
1962	2,017.8	13,669.7	14.8	15,188.6	13.3
1963	2,297.6	14,508.5	15.8	16,120.6	14.2
1964	2,613.3	15,744.1	16.6	17,493.4	14.9
1965	3,004.4	17,217.8	17.4	19,130.9	15.7
1966	3,444.2	19,062.7	18.1	21,180.8	16.3
1967	3,950.7	21,069.2	18.8	23,410.2	16.9
1968	4,104.8	22,700.5	18.1	25,222.8	16.3
1969	4,424.8	23,507.5	18.8	26,119.4	16.9
1970	4,480.7	23,801.0	18.8	26,445.6	16.9
1971	4,714.3	23,886.4	19.7	26,540.4	17.8
1972	5,085.2	25,177.8	20.2	27,975.3	18.2
1973	5,861.9	29,520.2	19.9	32,800.2	17.9
1974	6,741.2	36,049.1	18.7	40,054.6	16.8

[a]Source: Quarterly Bulletin of Agricultural Statistics, Cat. No. 21-003, Dominion Bureau of Statistics. (Excludes Newfoundland, Yukon and Northwest Territories.)

[b]Ninety percent of total investment is estimated to be in farm real estate, machinery, equipment and livestock, and ten percent in other investments.

percent of the loan amount if a province has thoroughly investigated each application. The duration of these arrangements varies with the purpose. Interest rates are generally one percent above the prime rate. Farmers who reported on bank credit in 1974 indicated that low risk farmers were paying one to two percent above the prime rate.

Interest rates on FILA non-land loans from late 1972 to mid-year 1973 were frozen at 6.25 percent and land loans were frozen at 7 percent. They then increased to 7 percent and 7.75 percent respectively. From October 1973 to April 1974 the respective rates were 8 and 8.25 percent. In August 1974 both rates were established at 9.75 percent and two months later were increased to 10

TABLE 6. CHARTERED BANKS PRIME BUSINESS LOANS RATES (CENTRAL BANK RATES IN BRACKETS) 1971-75

Month	1971	1972	1973	1974	1975
			— percent —		
January	7.00(6.00)	6.00(4.75)	6.00(4.75)	9.50(7.25)	10.50(8.25)
February	7.00(5.25)	6.00(4.75)	6.00(4.75)	9.50(7.25)	9.00-9.75(8.25)
March	6.50(5.25)	6.00(4.75)	6.00(4.75)	9.50(7.25)	9.00(8.25)
April	6.50(5.25)	6.00(4.75)	6.50(5.25)	10.50(8.25)	9.00(8.25)
May	6.50(5.25)	6.00(4.75)	7.00(5.75)	11.00(8.75)	9.00(8.25)
June	6.50(5.25)	6.00(4.75)	7.75(6.25)	11.00(8.75)	9.00(8.25)
July	6.50(5.25)	6.00(4.75)	7.75(6.25)	11.50(9.25)	9.00(8.25)
August	6.50(5.25)	6.00(4.75)	8.25(6.75)	11.50(9.25)	9.00(8.25)
September	6.50(5.25)	6.00(4.75)	9.00(7.25)	11.50(9.25)	9.75(9.00)
October	6.25(4.75)	6.00(4.75)	9.00(7.25)	11.50(9.25)	9.75(9.00)
November	6.00(4.75)	6.00(4.75)	9.00(7.25)	11.00(8.75)	
December	6.00(4.75)	6.00(4.75)	9.50(7.25)	11.00(8.75)	

Source: Bank of Canada Review (various issues).

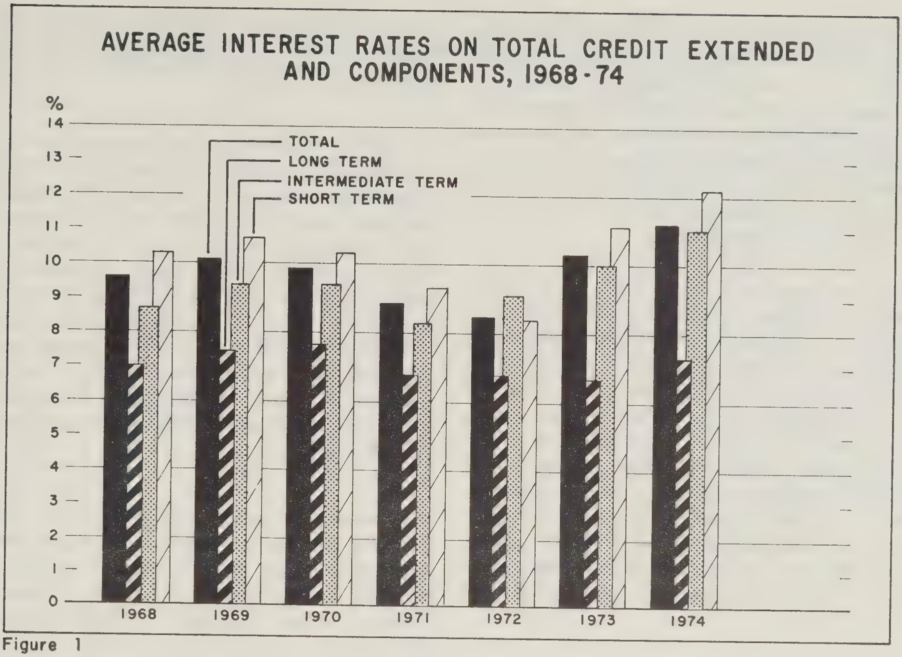

Figure 1

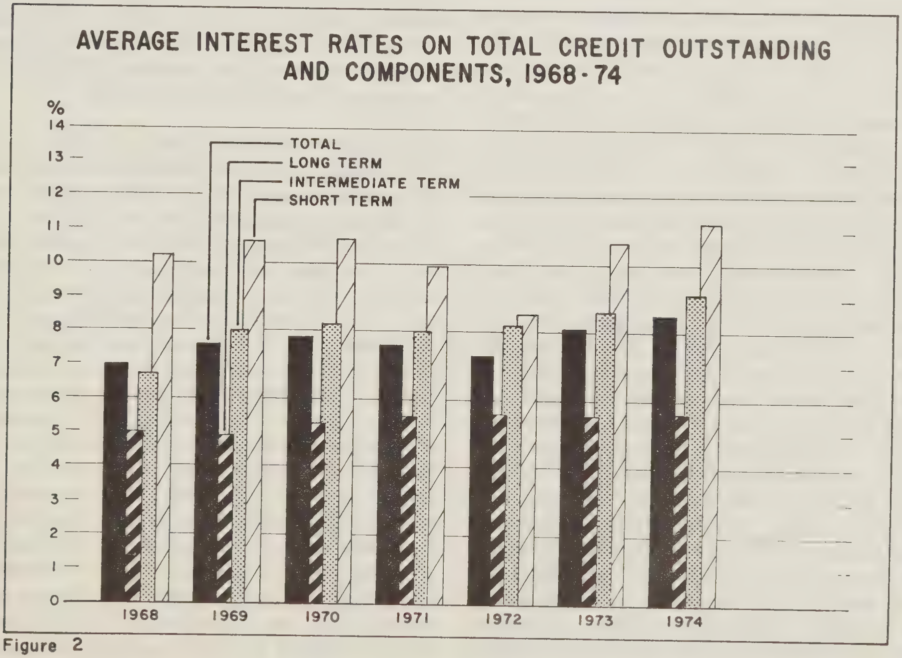

Figure 2

percent. In April 1974 bond formula rates were again applied and the rates changed to 8 and 8.5 percent, respectively. The current rates starting in October 1975 were respectively 8.75 and 9 percent. Long-term FCC loans were at 7 percent from the fall of 1972 to the end of March 1974, but changed to 8.25 percent in April and remained at that level until the first of October 1975 when a rate of 9 percent was established. This rate will apply until the end of March 1976.

The average estimated interest rates on all credit extended in 1973 was 10.3 percent compared with 11.2 percent in 1974. Estimated rates of long-, intermediate- and short-term credit extended for 1973 and 1974, were 6 and 7.3 percent, 10 and 11 percent, and 11.1 and 12.2 percent, respectively. On outstanding debt the average estimated interest rate paid for 1973 and 1974 was 8.2 and 8.6 percent, respectively, while for long-, intermediate-and short-term debt the estimated rates were 5.6 and 5.7, 8.7 and 9.2, and 10.7 and 11.3 percent, respectively. The total interest charges on outstanding debt for 1973 and 1974 are estimated to have been $479.4 million and $582.9 million, respectively (Figures 1 and 2).

OUTLOOK

Little statistical data on the actual credit extended in 1975 will be available before the late fall of 1976. Present forecasts are, therefore, largely based on comments made by representatives of the various sources on the current trend of their activities at mid-year 1975 or of their fiscal year 1975-76. It is expected that long-term credit extended in 1975 will be in the $725 million to $785 million range. If credit from provincial farm credit agencies increased as much in 1975 as it did in 1974 then the amount should be close to $785 million. However, there are some indications that the flow of credit from some of these sources may have decreased during mid-year 1975. Intermediate-term credit is expected to range from $920 to $980 million. Both increases and decreases are expected to occur on credit from various intermediate-term sources. The amount extended on FILA accounts is expected to be lower in 1975 than it was in 1974, and financing from supply companies for intermediate-term credit may further decrease. Loans from the Federal Business Development Bank, Alberta Treasury Branches and private individuals are expected to increase. The amount of short-term credit extended in 1975 is expected to be in the range of $2,700 million to $2,850 million. Short-term credit from most sources is expected to continue to increase. The bulk of the increase will be from chartered banks. Total credit extended form all sources in 1975 is expected to range from $4,345 million to $4,615 million.

The amount outstanding on all long-term loans in 1975 is expected to range from $2,660 to $2,720 million, intermediate-term from $1,940 to $1,970 million, and short-term from $2,700 million to $2,850 million. Total credit outstanding should, therefore, fall in the $7,300 million to $7,540 million range. In estimating the amount of credit outstanding, a review of credit extended in 1973 and 1974 in relation to the increase in amounts outstanding, suggests that repayment on long and intermediate accounts must have been abnormally heavy in 1975 since the increase in the outstanding amounts to certain credit sources was much lower than normally expected.

The continued strong world demand for food, reported shortages, poor harvests in other countries, increases in farm incomes over recent years, and improved farm prices for most products are expected to make most Canadian farmers optimistic on future incomes and should increase their demand for credit. The recently introduced national guidelines on prices should result in some control of farm input price increases without affecting farm product prices. As a consequence, the optimistic views of farmers will not be greatly changed by price control legislation, at least in the early stages of the program. Other factors, however, resulting from this legislation could indirectly affect farmers.

Federal and provincial farm credit budgets for 1976 are not expected to increase significantly over 1975 levels and may well decrease slightly. Increases in the number of loans from these sources will be largely due to the payment of debt making more loans possible. Interest rates of chartered banks are expected to remain at the currently high levels or slightly higher during the early part of the year. The effect of income and price controls and foreign views of the stability and prospects of the Canadian economy will largely determine whether the Canadian dollar increases or decreases relative to the American dollar. If the Canadian dollar decreases in value, the bond formula rate should increase and force FCC rates up on April 1, 1976. The current return on government bonds suggests that FCC rates may reach 10 percent by April 1976; however, bond yields will fall if the relative value of the Canadian dollar increases early in the new year. If this occurs the FCC interest rate would remain at about 9 percent. If the 10-percent rate applies to FCC loans in the spring of 1976 it is expected that the demand for long-term loans will decrease

slightly and have a cooling effect on increases in land values. The over-all outlook is that the amount of both long- and intermediate-term credit extended in 1976 will remain close to 1975 levels, but that short-term credit extended will continue to increase by about $400 or $500 million over the 1975 level.

ENERGY

Petroleum fuel prices are expected to increase during 1976.

Electricity prices are expected to increase about 10 percent in 1976 in most areas; increases may be as high as 25 percent in areas where fossil fuels are used to heat thermo-generating plants.

Actual shortfalls of natural gas may periodically occur through the 1970s and gas prices are expected to increase markedly.

*O.R. Morris**

INTRODUCTION

This paper focuses on some current issues facing governments in regard to energy policy. In the world context, policy actions of the OPEC countries create problems and issues for both oil-importing countries and the individual OPEC partners. In North America, the problem is to restructure energy policies such that other national conditions are not worsened.

In addition, considerable space is devoted to the Canadian natural gas situation since the National Energy Board hearings on the supply and deliverability of Canadian natural gas uncovered some new energy issues not previously recognized.

The cut-off date for new information for this paper was November 1, 1975. This is particularly important in the case of energy where significant events occur almost daily. The reader is cautioned that the situation may have changed significantly between the cut-off date and publication.

WORLD ENERGY SITUATION AND OUTLOOK

World crude oil production has been declining since its pre-embargo level of 58 million barrels a day (bb/d) in September 1973. Average production for 1973-74 held steady at about 55.7 million bb/d. For the first five months of 1975 the range was between 51.2 and 52 million bb/d, about 12 percent lower than the September 1973 level. Table 1 contains data on crude oil production rates in May 1975 for the major petroleum-exporting countries. About one third of the world production capacity is not being utilized. The OPEC countries provide the lion's share of the crude oil entering international trade.

Production in OPEC countries is dominated by one Arab producer, Saudi Arabia, which produces 24 percent, and by one non-Arab producer, Iran, which produces about 17.7 percent. Saudi Arabia has 29 percent of OPEC production capacity while Iran has 16.8 percent. At present, Saudi Arabia has the largest financial surplus while recent reports indicate that Iran has a more limited oil reserve, a massive development program and, hence, a high priority for cash. In Iran and many smaller OPEC countries, oil revenues, deflated by a price index for the commodities they import, (i.e., their real income from oil sales), have declined through much of the last 18 months. In countries where import expenditures are high relative to oil revenues, this can be sufficiently serious to retard economic development plans. The remedy they believe is to increase oil prices faster than import prices increase.

This latter situation has created serious problems among the partners in the OPEC cartel. At the September 28

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TABLE 1. CRUDE OIL PRODUCTION FOR MAJOR PETROLEUM EXPORTING COUNTRIES, MAY 1975

Country	Production	Production Capacity	Production Shut-in
	— thousands of barrels per day —		— percent —
Abu Dhabi*	1,410	2,000	29.5
Algeria	960	1,100	12.7
Iraq	2,360	2,600	9.2
Kuwait**	1,930	3,500	44.9
Libya	1,160	3,000	61.3
Qatar	470	700	32.9
Saudi Arabia**	6,990	11,500	39.2
Subtotal: Arab OPEC	15,280	24,400	37.4
Ecuador	110	240	54.2
Gabon	210	250	16.0
Indonesia	1,160	1,700	31.8
Iran	5,090	6,500	21.7
Nigeria	1,560	2,500	37.6
Venezuela	2,420	3,100	21.9
Subtotal: Non-Arab OPEC	10,550	14,290	26.2
Total: OPEC	25,830	38,690	33.2
Canada	1,500	1,980	24.2
Mexico	800	800	0
Total: OPEC, Canada, Mexico	28,130	41,470	32.2
Total World	51,580		

*Abu Dhabi is the only member of the United Arab Emirates (U.A.E.) which belongs to OPEC. The other U.A.E. members, Dubai and Sharjah, produced 270 and 30 thousand barrels per day, respectively, in May 1975. Their respective production capacities were 300 and 100 thousand.

**Includes Neutral Zone, which contributes approximately 250,000 barrels per day to each country.

Source: Reproduced from Monthly Energy Review, Federal Energy Administration, National Energy Information Center, Washington, D.C., August 1975.

OPEC Vienna Conference, a Saudi Arabian proposed price freeze was voted down and an Iranian proposal for a 15-percent price increase was accepted (opposed by Saudi Arabia and Abu Dhabi). Saudi Arabia later said its oil would be offered at $10.46, $1.55 less than the level set by other OPEC states with no restrictions on production. OPEC subsequently announced that a 10-percent price increase has been agreed to.

However, the effective increase will be less than 10 percent since some of the OPEC partners' price premiums and differentials are being revised. This past summer Iraq, Libya and Nigeria offered their crude oil more competitively by reducing the premiums charged for gravity, low sulphur content and freight, as well as offering extended credit to purchasers. This boosted their production – e.g., in June, Libya produced 160 percent of its March level – but Saudi Arabia reduced its production by a compensating amount. In the short run, consumers and companies stand to gain by this competition on premiums and differentials, but in the long run, Saudi Arabia's use of oil prices in its dealings with western countries is strengthened. Saudi Arabia's increased shut-in capacity leaves the importing western countries more vulnerable to policy changes inside that country.

Even if the OPEC cartel manages to escape an internally-generated collapse, four factors constrain its power over world oil prices. First, there is an increasing interdependence between oil-producing and western nations. The oil-producing nations have "petro-dollars" invested in western countries to earn non-oil income and they want to affect the technology transfer to their countries from the western oil importers. Second, there is an increasing common interest between developed and developing oil-importing countries. The effects of the OPEC oil price increases have been especially hard on the oil-importing less-developed countries (ldc); they have had to pay more for oil as well as other imported goods and services. The non-oil ldc's balance of trade

plunged from a deficit of $9 billion in 1973 to $28 billion in 1974 and this could reach $35 billion for 1975. Of the $19 billion increase in the non-oil ldc's 1974 trade deficit, oil price increases directly accounted for about $8 billion. The non-oil producing ldc contain about two thirds of the world's population and they are becoming increasingly hostile toward their former allies in the OPEC cartel. Third, arbitrary misuse by OPEC of its new powers could lead to developed countries releasing access to their strategic stockpiles to undeveloped countries so they have some security against another buffeting by OPEC; politically this could be a worthwhile gesture. Fourth, world market forces could cause widespread economic recession thereby reducing purchases of OPEC oil for long periods; to some extent this has already been quite effective.

World petroleum and natural gas production is also complicated on the exploration and development front by OPEC price-determining powers. Many recent petroleum discoveries and some of the older but more remote fields are only now beginning to be economically feasible at the recent higher energy price levels. For example, the North Sea gas and oil discoveries, the Canadian discoveries in the Arctic and Labrador coasts and the Alberta Tar Sands were not profitable investments until very recently. All these energy sources will require very large amounts of investment funds to develop them into marketable reserves. A country such as Saudi Arabia, with a relatively small population, large reserves (both of oil and cash) and a high shut-in capacity, can create sufficient uncertainty in the world oil market to make development investment too risky relative to projected rates of return.

Ironically, the economic feasibility of some of the recent discoveries at current world crude oil prices also create uncertainties for OPEC countries. If the current prices persist and investors develop new discoveries, then both the revenue from OPEC reserves and their value will decline substantially. Hence, it behooves the OPEC partners to create sufficient uncertainty in world markets to discourage development of non-OPEC reserves. But, with uncertain conditions in world capital markets, the OPEC countries lose opportunities to invest their oil revenues profitably.

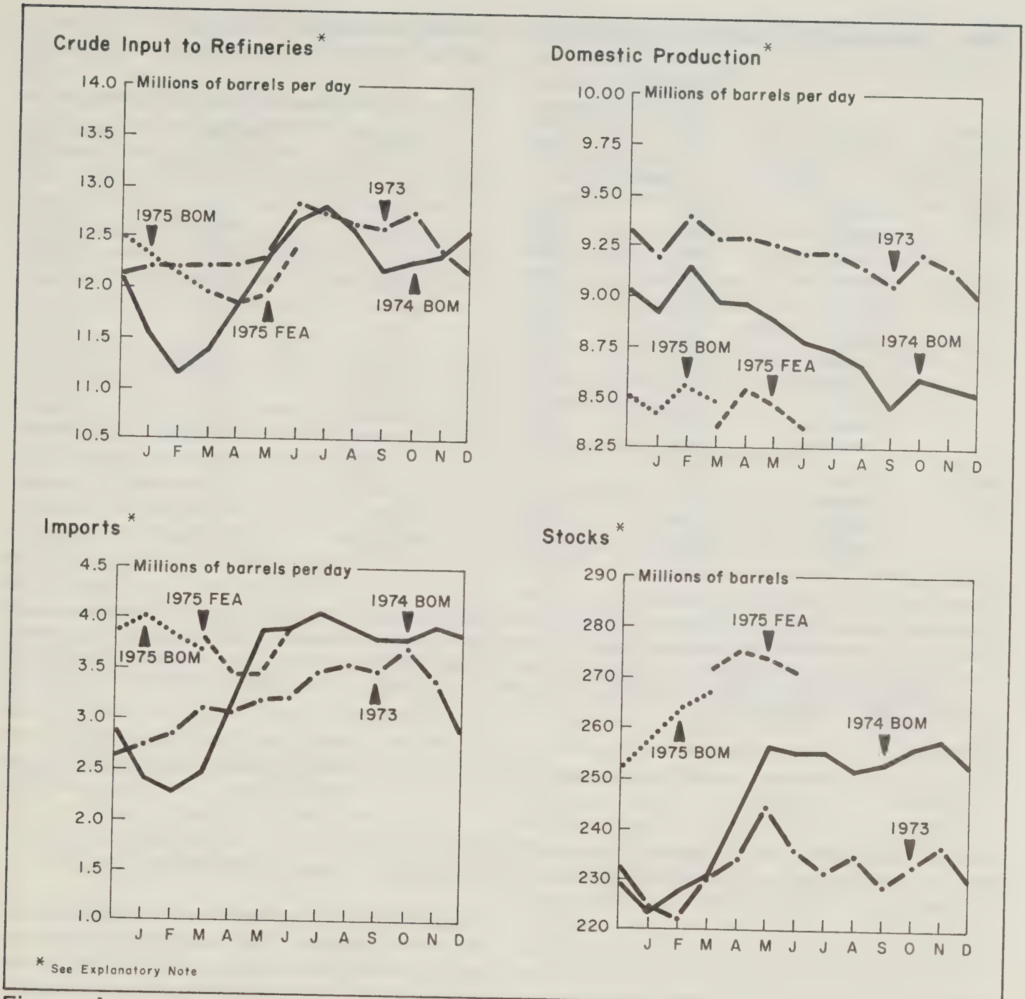
One way of creating sufficient economic stability to generate the investment for recent discoveries would be a set of floor prices for imported crude oil in each of the oil-importing countries. But, to do this, the OPEC countries would also have to be assured of a market for a specified proportion of their production, and be allowed to invest in developing the new discoveries. This means that a whole pot-pourri of trade and development agreements must be negotiated among the oil-consuming and the oil-producing countries. Such negotiations would require considerable time. Furthermore, most countries require some form of legislative ratification before such international agreements can become effective solutions to world problems. However, until, and even after, such accord is reached, the outlook is for oil prices to remain significantly higher than pre-embargo levels, and continued uncertainty in the availability of capital for exploration and development.

NORTH AMERICAN SITUATION

U.S. Crude Oil

The U.S. crude oil situation for the period January 1973 to May 1975 is shown in Figure 1. In January 1975 crude input to U.S. refineries exceeded both 1973 and 1974 levels, but by the second quarter it was below 1973 and 1974 levels. Daily domestic production of U.S. crude has declined steadily from 9.2 million bb/d in January 1973 to 8.5 million bb/d in March 1975 and more recent Federal Energy Administration (FEA) preliminary estimates show a further decline to 8.4 million bb/d by June, 1975. U.S. crude imports during the first quarter of 1975 were at the same level as the last half of 1974 but decreased by nearly 500,000 bb/d during the second quarter of 1975. However, by July 1975 estimated imports were almost at the January 1975 level. The most marked change in the U.S. oil situation was in crude oil stocks, which at the beginning of 1975 were about 117 percent of 1974 levels; by mid-1975 this had fallen to below 107 percent.

Monthly price information for 1974 and 1975 for different kinds of crude oil utilized in the United States is shown in Table 2. The composite price for crude is most representative of crude costs to U.S. petroleum refiners since there is a price equalization program in effect. Despite the so-called free market price permitted for new oil, the anticipated surges in reserves and production have not occurred. Other measures undertaken by government, e.g. the virtual elimination of depletion allowances, have acted to counter the incentive factors in the higher wellhead prices. Pessimists argue that, despite the higher return to the wellhead, both reserves and production are continuing to go down; they use this argument to bolster support for controlled prices. Optimists argue there has been an incentive factor, as evidenced in the number of holes and footage drilled, but the lead time before the incentives show in reserves and production is a matter of years. The fact is that, aside from the continuing exploration and develop-



Crude Input to Refineries*
Millions of barrels per day
14.0
13.5
13.0
12.5
12.0
11.5
11.0
10.5
1973
1975 BOM
1974 BOM
1975 FEA
J F M A M J J A S O N D
Domestic Production*
Millions of barrels per day
10.00
9.75
9.50
9.25
9.00
8.75
8.50
8.25
1973
1975 BOM
1974 BOM
1975 FEA
J F M A M J J A S O N D
Imports*
Millions of barrels per day
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
1975 FEA
1974 BOM
1975 BOM
1973
J F M A M J J A S O N D
Stocks*
Millions of barrels
290
280
270
260
250
240
230
220
1975 FEA
1974 BOM
1975 BOM
1973
J F M A M J J A S O N D
* See Explanatory Note

Figure 1

TABLE 2. CRUDE PETROLEUM PRICES IN THE UNITED STATES BY MONTHS, 1974-1975

Year	Month	Domestic Crude Petroleum Prices at the Wellhead		Refiner Acquisition Cost of Crude Petroleum**		
		Old	New	Domestic	Imported	Composite
		— dollars per barrel —		— dollars per barrel —		
1974	January	5.25	9.82	6.72	9.59	7.46
	February	5.25	9.87	7.08	12.45	8.57
	March	5.25	9.88	7.05	12.73	8.68
	April	5.25	9.88	7.21	12.72	9.13
	May	5.25	9.88	7.26	13.02	9.44
	June	5.25	9.95	7.20	13.06	9.45
	July	5.25	9.95	7.19	12.75	9.30
	August	5.25	9.98	7.20	12.68	9.17
	September	5.25	10.10	7.18	12.53	9.13
	October	5.25	10.74	7.26	12.44	9.22
	November	5.25	10.90	7.46	12.53	9.41
	December	5.25	11.08	7.39	12.82	9.28
1975	January	5.25	11.28	7.78	12.77	9.48
	February	5.25	11.39	8.29	13.05	10.09
	March	5.25	11.47	8.38	13.28	9.91
	April	5.25	R11.64	R8.23	R13.26	R9.83
	May	5.25	*11.70	*8.22	*13.11	*9.76

*Preliminary figure based on early reports.

**The refiner acquisition cost of imported crude petroleum is the average landed cost of imported crude petroleum to the refiner and represents the amount which may be passed on to the consumer. The estimated landed cost of imported crude petroleum from selected countries does not represent the total cost of all imported crude. Imported crude costs to U.S. company-owned refineries in the Caribbean are not included in the landed cost, and costs of crude petroleum from countries which export only small amounts to the U.S. are also excluded.

R = Revised.

Source: Monthly Energy Review. Federal Energy Administration, National Energy Information Center, Washington, D.C., August 1975.

ment in the lower 48 states, the emphasis is increasing on the so-called frontier areas, particularly the offshore and Alaska.

U.S. Oil Policy

Establishing national oil or energy policies for the United States is a complex economic and political problem, further complicated at present by a heavily Democratic Congress facing a Republican Administration. Both the White House and Congress recognize the problem and agree on the need for positive action. But, they cannot agree on the action program and how to achieve the proclaimed objective of as high a degree of self-sufficiency as possible. Essentially the White House places considerable emphasis on working toward a freer, if not a free, market system with the price mechanism and economic factors as the basic determinants of demand. Congress, however, in general rejects this concept and favors increased reliance on regulation and control. Its basic reason is the belief that liberalizing prices would contribute to recession and inflation. Thus, White House energy policy initiatives have been stymied by its inability to obtain the required legislation.

Another factor rises within Congress itself where an array of committees and sub-committees in both House stake out areas, within the energy field as being under their purview. In addition, the White House Administration situation is such that while the Administration cannot get its policy legislation enacted, the President has been able to counter through the inability of Congress to override his vetoes. The future is uncertain. Currently, hundreds of bills are at various stages in the legislative process. However, so long as the gap in the methodology of achieving self-sufficiency objectives and the present Administration-Congressional balance remains, the chances of establishing a far-reaching energy policy by legislation are quite small. Bits and pieces of legislation will emerge over the next few months but a comprehensive policy is not foreseeable. To further compound the problem, 1976 is a Presidential election year; traditionnally in the several months prior to an election, little new legislation is passed.

Despite this difficult situation, Congress may well have to extend present legislation to preserve some semblance of the system now administered by the agencies, particularly the Federal Energy Administration. The basic fact is that the United States has lost its power to determine price and important segments of supply. These elements are now in foreign control. Therefore it seems that, while no over-all energy policy is foreseeable, the United States will try to hold the policy fabric together by reacting to factors beyond its control. Yet it is believed in most quarters that by one way or another the country will "muddle through".

Some critical significance should be given to the date November 15, 1975 when, unless Congress intervenes, the Energy Petroleum Allocations Act expires; it is the authority for allocation and price controls. Thus, pressure is on Congress, which is currently wrestling in a House-Senate conference with one element of the energy program. Included in the legislative initiatives are standards for energy conservation, establishment of a strategic petroleum reserve and standby authority for the President to ration gasoline, to ban night-time outdoor advertising and to cut back on non-essential lighting in office buildings. A further initiative is to require public utility power plants to convert to coal. A general presumption is that if the House and Senate can agree on these and several other provisions, the President would not veto such legislation. However, the issue of price is paramount and if both Houses agree on the continuation of price controls there is the strong possibility that the President will use his veto power.

Outlook for U.S. Petroleum

The outlook for U.S. petroleum is for higher prices so long as a policy of more self-sufficiency limits the importation of foreign-produced crude oil. As noted earlier, a policy of self-sufficiency in energy can be undermined by very slight increases in foreign crude oil production, thereby making U.S. domestic energy development a high-risk undertaking for private capital. If the United States participates in a series of international agreements that provide price supports for a participating country's energy sources, the result will be higher energy costs for most countries including the United States.

U.S. Natural Gas Situation

The U.S. natural gas situation for the period 1973-75 is shown in Figure 2. Marketed production was notably lower in the first half of 1975 than during the same periods in 1973 and 1974, as were producer sales to interstate pipelines. Imports, principally from Canada, were slightly lower in the first half of 1975 compared with the first half of 1974.

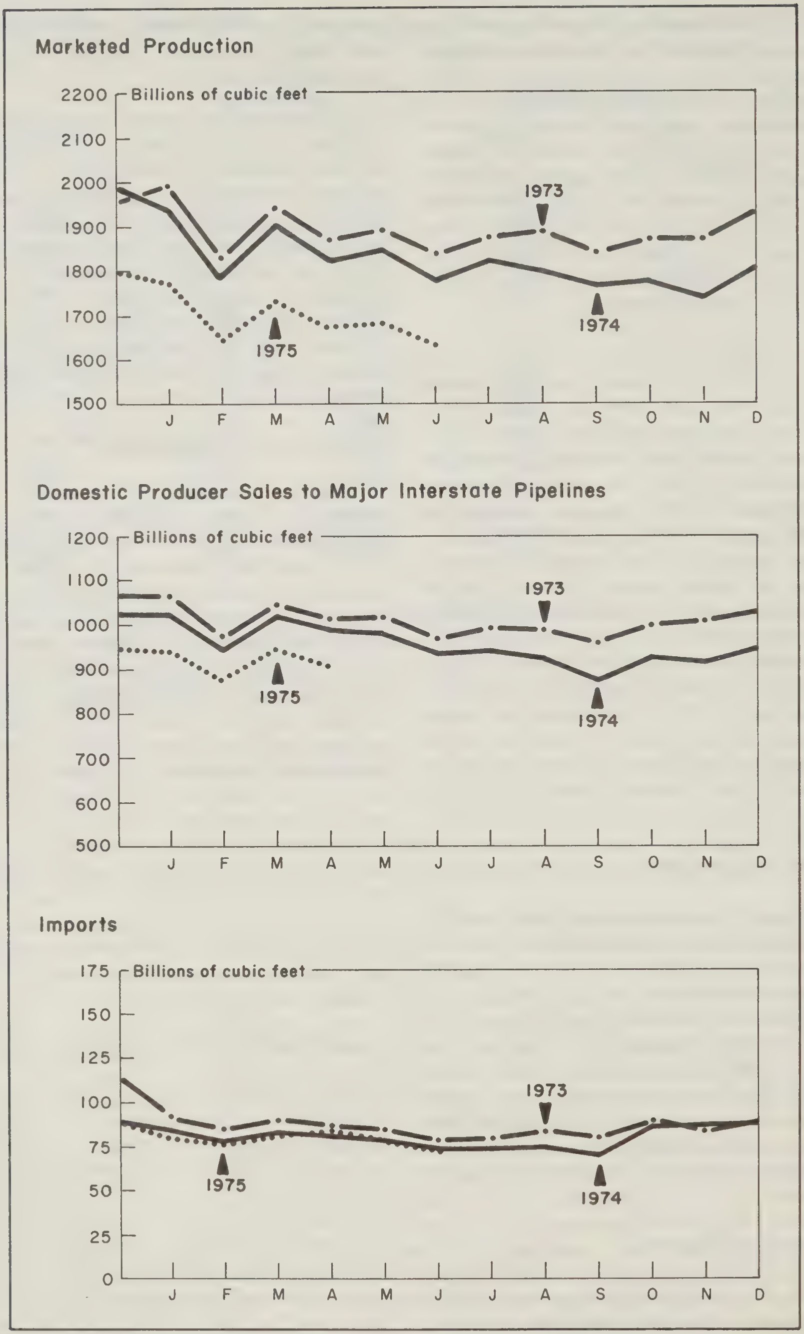
These changes reflect a more fundamental situation in the market. Gas sold in interstate commerce is priced by the U.S. Federal Power Commission at 51 cents per thousand cubic feet while gas produced and marketed within a producing state can be sold at prices competitive with crude petroleum. Consequently, U.S. natural gas producers are refusing to sell to interstate pipeline companies. Producers are either selling to intrastate purchasers (currently at about $1.25 per thousand cubic feet, but up to $2.00 in Texas) or holding the gas in the well anticipating higher prices on interstate sales of gas.

Outlook for U.S. Natural Gas

The outlook for natural gas is similar to that for petroleum. Congress seems disinclined to remove the restrictions on interstate natural gas prices. But until there is parity between intrastate and interstate prices it behooves gas producers to keep any shut-in gas production to sell on intrastate markets where the price is two to four times the current interstate price. At the same time, if gas does not flow from the producing areas to consuming areas through the interstate pipelines, some industrial areas particularly in the Northeast, Eastern Seaboard and some mid-Western states are faced with up to 40-percent shortfalls in the quantity of gas required for direct household heating, electric power generation and industrial production. At present, an over-all shortfall of about 20 percent or 2.9 trillion cubic feet has been forecast for 1976. Most of the shortfall will have to be borne in the industrial sector. On the other hand, if interstate prices are allowed to become competitive with intrastate prices, the industrial areas mentioned above face a worsening competitive relationship with those in the gas-producing states.

CANADIAN PETROLEUM SITUATION

In January 1974, the principle of a single crude oil price for Canadian refiners, adjusted for location, transportation and quality differences, was accepted at a conference of Canadian First Ministers. In March 1974, a wellhead price of $6.50 a barrel was established for domestically-produced crude oil and a federal Oil Compensation Program compensating Canadian importers against higher-priced imports and financed from federal export taxes on exported Canadian crude oil was introduced. In April 1975, a new wellhead price of $8.00 a barrel was established for the period July 1, 1975 through June 30, 1976. The new price increased



Marketed Production
Billions of cubic feet
2200
2100
2000
1900
1800
1700
1600
1500
1973
1974
1975
J F M A M J J A S O N D
Domestic Producer Sales to Major Interstate Pipelines
Billions of cubic feet
1200
1100
1000
900
800
700
600
500
1973
1974
1975
J F M A M J J A S O N D
Imports
Billions of cubic feet
175
150
125
100
75
50
25
0
1973
1974
1975
J F M A M J J A S O N D

Figure 2

TABLE 3. AVERAGE DAILY RECEIPTS OF CANADIAN CRUDE OIL REFINERS, AVERAGE DAILY IMPORT RATES, AND AVERAGE DAILY EXPORT RATES OF CRUDE OIL TO AND FROM CANADA, 1974-1975

Year and Quarter	Received By Canadian Refiners from Domestic Sources[a]	Imports to Canada[a]	Total Received By Canadian Refiners	Exports to U.S.A.[b]	Net Exports
		— thousand barrels of 35 Canadian gallons a day —q			
1974					
1	992.0	822.8	1,814.8	975.1	152.3
2	963.6	812.9	1,776.5	947.1	134.2
3	935.5	800.2	1,735.7	849.7	49.5
4	907.3	840.8	1,748.1	873.3	−32.5
1975					
1	872.7	853.5	1,726.2	735.1	−118.4
2	859.8	871.9	1,731.7	598.0	−273.9

[a]Calculated from data taken from Refined Petroleum Products, Statistics Canada, Catalogue No. 45-004.
[b]Data provided by Department of Energy, Mines and Resources.

gasoline prices by about four or five cents a gallon, effective September 1975. Effective June 23, 1975, a federal excise tax of 10 cents a gallon was imposed on gasoline to stimulate conservation; the tax is rebated to commercial users, including farmers. The governments of Manitoba and Ontario froze gasoline prices at their pre-July level until November 1 and November 15, respectively.

Table 3 contains data on Canada's petroleum situation by quarters for the period January 1, 1974 to June 30, 1975. On November 22, 1974 the federal government announced a new oil policy phasing out Canadian crude exports to the United States starting January 1975, and ending them by 1983. Canadian crude exports to the United States were reduced to an average rate of 735,100 bb/d in the first quarter of 1975 from 975,100 during the first quarter of 1974, a reduction of 24.6 percent. In the second quarter of 1975 the rate was 598,000 bb/d, down from 947,100 during the second quarter of 1974. During the first quarter of 1975 the average import rate of crude into Canada was 853,500 bb/d compared to 822,800 during the first quarter of 1974. The second quarter import rate was 871,900 bb/d in 1975 and 812,000 in 1974. The average rate of Canadian net exports of crude oil declined from 152,300 bb/d to a −32,500 bb/d (i.e. a net import) in 1974. By the second quarter of 1975 the average import rate exceeded the average export rate by 273,900 bb/d. In short, since the beginning of October 1974, Canada has become a net importer of foreign crude oil.

Information on the Canadian energy situation is given in tables 4 to 9. The following are the highlights of this information:

TABLE 4. PRODUCTION, NET SALES AND CLOSING INVENTORIES OF MOTOR GASOLINE, DIESEL FUEL OIL, LIGHT FUEL OIL AND LIQUIFIED PETROLEUM GASES, IN CANADA: 1963-67, 1968-72 TO 1975

Year and Quarter	Motor Gasoline	Diesel Fuel Oil	Light Fuel Oil[a]	Liquified Petroleum Gases	
	PRODUCTION				
	— thousand barrels of 35 Canadian gallons —				
1975					
1	51,908	14,577	30,949	2,675	March
1974	212,785	72,497	118,877	8,791	
1	51,327	16,190	34,979	2,154	March
2	50,940	19,689	25,366	1,951	June
3	56,076	19,356	26,374	2,352	Sept.
4	54,442	17,262	32,158	2,334	Dec.
1973	201,230	69,494	118,202	7,936	
1	45,333	15,906	33,673	1,997	March
2	47,808	17,926	22,896	1,705	June
3	55,718	18,556	28,895	2,260	Sept.
4	52,371	17,106	32,738	1,974	Dec.
1972	185,378	64,747	107,543	6,980	
1	43,814	13,715	30,952	1,684	March
2	41,946	16,273	21,649	1,654	June
3	50,884	18,042	25,536	1,974	Sept.
4	48,734	16,717	29,406	1,668	Dec.
1971	166,989	60,505	101,819	7,487	
1	39,470	12,530	28,463	2,048	March
2	38,208	14,753	21,362	1,719	June
3	45,521	17,580	23,166	1,871	Sept.
4	43,790	15,742	28,828	1,849	Dec.
Av 1968-72	163,830	55,676	95,365	8,121	
Av 1963-67	128,162	39,342	79,526	8,464	

TABLE 4. PRODUCTION, NET SALES AND CLOSING INVENTORIES OF MOTOR GASOLINE, DIESEL FUEL OIL, LIGHT FUEL OIL AND LIQUIFIED PETROLEUM GASES, IN CANADA, 1963-67, 1968-72 TO 1975 (continued)

NET SALES

1975					
1	46,854	14,367	50,150	1,821	March
1974	209,199	68,048	125,078	6,533	
1	45,569	14,699	54,603	1,717	March
2	52,273	17,328	22,647	1,387	June
3	58,593	17,952	9,102	1,679	Sept.
4	52,764	18,069	38,726	1,750	Dec.
1973	203,406	62,394	124,361	6,183	
1	43,284	12,995	51,470	1,670	March
2	50,688	15,722	20,928	1,346	June
3	58,005	17,004	11,709	1,658	Sept.
4	51,429	16,673	40,254	1,509	Dec.
1972	184,770	55,817	131,810	6,170	
1	39,837	11,894	56,549	1,655	March
2	45,933	14,406	21,799	1,334	June
3	52,564	15,140	10,574	1,565	Sept.
4	46,436	14,377	42,888	1,616	Dec.
1971	174,952	51,272	122,278	5,591	
1	36,619	10,352	51,545	1,391	March
2	43,259	13,250	20,265	1,109	June
3	50,612	14,600	11,301	1,474	Sept.
4	44,462	13,070	39,167	1,617	Dec.
Av 1968-72	167,625	48,552	120,102	5,126	
Av 1963-67	128,855	35,645	96,030	6,687	

CLOSING INVENTORIES

1975					
1	30,227	12,341	26,264	571	March
1974	24,686	14,627	32,912	544	
1	26,322	11,296	24,020	606	March
2	25,972	13,409	37,638	570	June
3	23,618	18,937	42,093	566	Sept.
4	25,006	15,973	39,680	563	Dec.
1973	21,543	14,875	36,422	592	
1	25,937	11,484	17,085	360	March
2	21,749	12,474	21,013	471	June
3	20,497	16,374	39,085	513	Sept.
4	21,543	14,875	36,422	592	Dec.
1972	22,991	13,579	29,312	377	
1	25,461	10,419	15,490	340	March
2	22,106	11,587	19,995	387	June
3	20,929	14,921	36,945	428	Sept.
4	22,991	13,579	29,312	377	Dec.
1971	21,783	13,341	33,008	357	
1	27,118	9,977	15,195	413	March
2	24,008	11,626	20,383	509	June
3	21,320	14,576	37,025	443	Sept.
4	21,783	13,341	33,008	357	Dec.
Av 1968-72	23,403	11,572	30,310	397	
Av 1963-67	20,498	8,057	27,818	416	

[a]Includes stove oil, kerosene and tractor fuel.

Source: Canadian Statistical Review, Catalogue Number 11-505 and 11-003, Statistics Canada.

- In general, production and net sales of refined petroleum products increased in 1974 (Table 4).
- The farm input price indexes for petroleum products show a persistent upward trend through 1974 and the first half of 1975 (Table 7).
- Both current and real expenditures by farmers for fuel and oil increased from 1971 to 1974; the most significant increase occurred during 1974. Current expenses for electricity and telephone increased noticeably but the real expenditure level remained virtually unchanged from 1971 through 1975 (Table 8).
- Canadian production of electricity increased, but at a slightly decreased rate, from 1973 to 1974. In the first half of 1975 electricity production in provinces east of Ontario was less than during the first half of 1974. Net exports of electricity in 1974 were 12 percent below 1973 levels; exports in the first half of 1975 were 57.7 percent less than 1974 levels (Table 9).

Recent High Arctic Discoveries

In late October 1975, Panarctic Oils announced a major new oil discovery at its site on Cameron Island. While this announcement is encouraging, it does not represent a potential end to Canada's future petroleum shortages. The encouraging thing is that, first, oil has been discovered in a different geological environment than that typically associated with oil discoveries in the rest of the world. Secondly, the new well has a sufficient flow rate of high quality crude oil (3,000 bb/d) to warrant the construction of a small refinery or "topping plant" to supply refined products to local exploration operations. In areas such as the Canadian High Arctic, this will significantly reduce exploration costs. The announcement must also be considered in light of past experience in High Arctic exploration. During the late 1960s, some major natural gas discoveries were made in the Beaufort Sea and the Arctic Islands. But during the first half of the 1970s, exploration results have been exceedingly disappointing from both geological and economic viewpoints.

TABLE 5. NET SALES OF PETROLEUM PRODUCTS AVAILABLE FOR DISTRIBUTION IN CANADA, BY PROVINCE, YEAR (1963-67, 1968-72 TO 1975), AND PRODUCT

— thousand barrels of 35 Canadian gallons —

Motor Gasoline

Year	Atlantic Provinces	Quebec	Ontario	Prairies	B.C.	Canada[a]
1975	Not Available					
1974	17,782	49,371	77,404	42,676	21,338	209,199
1973	16,727	50,178	73,230	39,528	20,631	200,839
1972	15,619	44,396	68,503	37,433	19,050	185,495
1971	13,595	41,702	64,407	35,578	17,645	173,386
Av 1968-72	13,266	41,061	61,459	34,611	16,756	167,538
Av 1963-67	9,548	30,082	47,682	28,822[c]	12,371[d]	128,746

Diesel Fuel Oil

Year	Atlantic Provinces	Quebec	Ontario	Prairies	B.C.	Canada[a]
1975	Not available					
1974	9,391	12,521	14,970	18,033	11,500	68,048
1973	7,682	12,676	14,341	16,018	10,545	62,661
1972	7,384	9,943	12,200	15,126	9,448	55,391
1971	6,981	8,827	11,497	13,770	8,725	51,020
1968-72	6,718	8,603	10,762	13,562	8,014	48,622
1963-67	4,748	7,176	7,055	10,807[c]	5,601[d]	35,697

Light Fuel Oil

Year	Atlantic Provinces	Quebec	Ontario	Prairies	B.C.	Canada[a]
1975	Not Available					
1974	20,638	45,023	45,153	4,753	8,755	125,078
1973	17,006	41,678	37,042	5,030	6,780	108,235
1972	17,356	41,133	41,848	4,449	7,428	112,829
1971	14,003	38,879	39,672	4,211	6,702	104,000
Av 1968-72	13,541	37,066	39,705	4,447	6,164	101,441
Av 1963-67	8,510	25,875	32,972	4,998[c]	4,691[d]	77,320

Kerosene and Stove Oil

Year	Atlantic Provinces	Quebec	Ontario	Prairies	B.C.	Canada[a]
1975	Not Available					
1974	"	"				
1973	4,086	6,075	2,945	2,610	1,529	17,561
1972	4,854	6,809	3,169	3,198	1,703	20,015
1971	4,560	6,230	3,425	2,845	1,700	19,056
1968-72[b]	4,613	6,449	3,401	2,951	1,753	19,452
1963-67	3,936	6,272	3,662	2,707[c]	1,796[d]	18,523

[a]Includes Northwest Territories and Yukon.
[b]Includes tractor fuel oil for the year 1969.
[c]Includes Northwest Territories for the year 1963.
[d]Includes Yukon for the year 1963.

Source: Refined Petroleum Products, Catalogue No. 45-208, Statistics Canada, Ottawa; Canadian Statistical Review, Statistics Canada.

TABLE 6. NET SALES OF MOTOR GASOLINE AND DIESEL FUEL OIL, TO FARMS FOR CANADA, BY PROVINCE, YEAR (1963-67, 1968-72 TO 1975), AND PRODUCT

— thousand barrels of 35 Canadian gallons —

Motor Gasoline

Year	Atlantic Provinces	Quebec	Ontario	Prairies	B.C.	Canada[a]
1975	Not Available					
1974	954	1,928	4,383	11,911	1,075	20,292
1973	923	1,803	4,238	11,491	1,047	19,532
1972	783	1,534	4,417	11,169	925	18,850
1971	889	1,423	4,373	10,839	929	18,473
Av 1968-72	899	1,629	4,464	10,422	876	18,311
Av 1963-67	Not Available					

Disel Fuel Oil

Year	Atlantic Provinces	Quebec	Ontario	Prairies	B.C.	Canada[a]
1975	Not Available					
1974	454	369	1,415	4,990	454	7,689
1973	413	349	1,281	4,624	415	7,087
1972	372	423	1,029	4,328	340	6,498
1971	329	340	971	4,068	376	6,086
Av 1968-72	Not Available					
Av 1963-67	Not Available					

[a]Includes Northwest Territories and Yukon.

Source: Refined Petroleum Products, Catalogue No. 45-208, Statistics Canada; Canadian Statisitical Review, Statistics Canada, Ottawa.

TABLE 7. FARM INPUT PRICE INDEX: PETROLEUM PRODUCTS, CANADA 1962 TO 1975

(1961=100)

Year and Quarter	East	West	Canada
1975			
1	172.5	143.9	153.3
2	175.8	148.6	157.6
1974	164.1	135.2	144.7
1	155.6	130.3	138.6
2	155.8	126.8	136.4
3	173.0	140.6	151.3
4	172.1	143.0	152.6
1973	135.6	123.5	127.5
1	125.9	120.7	122.4
2	128.7	120.9	123.5
3	139.7	123.7	129.0
4	147.9	128.5	134.9
1972	125.8	117.1	120.0
1	126.4	116.4	119.7
2	126.3	116.8	119.9
3	126.4	117.4	120.4
4	124.0	117.7	119.8
1971	124.5	113.8	117.3
1	120.9	112.5	115.3
2	125.2	113.2	117.2
3	125.7	113.7	117.7
4	126.3	115.6	119.1
1970	119.2	110.6	113.5
1969	116.6	110.0	112.2
1968	113.7	107.2	109.3
1967	110.8	101.1	104.3
1966	108.4	98.9	102.0
1962	100.6	99.6	100.0

A more realistic expectation for the Canadian High Arctic exploration is that future exploration efforts will be shifted to formations in geological environments more closely representing those of the Alberta discoveries. At this time, one should not discount in any way the investment uncertainties associated with developing a new oil reserve as discussed in previous sections.

Outlook for Canadian Petroleum

Canadian production is expected to decline over the next few years. So long as world energy prices remain as uncertain as at present, there will be a continuing delay in the development of Frontier petroleum and gas reserves and of the Alberta Tar Sands. In terms of December 1974 prices, projected investment in energy development will have to increase from a level of about 3 percent to about 6 percent of Canada's GNP to bring in Frontier reserves and to develop the electricity supply to keep reasonable pace with projected uses.

CANADIAN NATURAL GAS

Last year an optimistic position was taken in regard to the situation and outlook for natural gas, based primarily on the size of Canadian gas reserves. Between November 1974 and March 1975 the National Energy Board (N.E.B.) held hearings in several Canadian cities on the deliverability of Canadian natural gas to Canadian and export markets. A report of these hearings, including conclusions and recommendations was published and released this summer.

Canadian domestic demand increased from 430 billion cubic feet a year to slightly over 1,300 billion cubic feet from 1962 to 1972. During this period, gas exports to the United States amounted to 45 percent of marketable pipeline production. These exports, authorized by the N.E.B., were required to make pipeline construction and

TABLE 8. FARMERS' CURRENT EXPENDITURES FOR ENERGY, ENERGY PRICE INDEXES AND REAL EXPENSES FOR CANADA, 1962-74

	Fuel and Oil			Electricity and Telephone		
Year	Current[a] Expenses —dollars—	Petroleum[b] Index —1961=100—	Adjusted Expenses —1961 dollars—	Current[a] Expenses —dollars—	Electricity[b] Price Index —1961=100—	Adjusted Expenses —1961 dollars—
	— thousands of dollars —					
1974	436,485	144.7	301,648	52,585	129.6	40,575
1973	319,116	127.5	250,287	49,345	122.1	40,414
1972	282,425	120.0	235,354	51,011	114.1	44,707
1971	269,070	117.3	229,386	50,799	113.9	44,600
1968-72	259,907	114.5	226,911	50,147	109.6	45,810
1963-67	212,293	101.6	208,865	43,672	98.6	44,301

[a]Farm Net Income, Cat. No. 21-202, Annual, Statistics Canada.

[b]Prices and Price Indexes, Cat. No. 62-002, Monthly, Statistics Canada.

TABLE 9. ELECTRIC ENERGY AVAILABLE BY PROVINCE, 1963-67, 1968-72 AND 1972-75 BY QUARTERS

Year	Atlantic Provinces	Quebec	Ontario	Prairies	British Columbia	Canada[a]	Net Exports
				— million kilowatt hours —			
1975							
1st quarter	5,403	25,182	24,273	9,368	9,299	73,710	1,672
2nd quarter	4,422	20,908	21,584	7,771	8,277	63,122	1,455
1974							
1st quarter	4,986	24,804	23,614	9,204	8,850	71,623	4,049
2nd quarter	4,539	21,612	20,967	7,651	8,070	62,980	3,347
3rd quarter	4,231	20,530	20,776	7,559	7,541	60,782	3,485
4th quarter	4,727	24,417	23,254	8,756	8,883	70,614	2,074
TOTAL	18,883	91,363	88,611	33,170	33,344	265,999	12,955
1973							
1st quarter	4,376	21,848	22,157	8,302	8,569	65,867	3,446
2nd quarter	4,038	19,586	19,813	7,142	7,859	58,577	3,981
3rd quarter	3,972	18,244	19,614	7,167	7,688	56,818	4,152
4th quarter	4,577	22,286	22,188	8,765	8,777	66,751	3,138
TOTAL	16,963	81,964	83,772	31,376	32,893	248,013	14,717
1972							
1st quarter	4,046	19,934	20,848	7,803	7,918	60,694	1,338
2nd quarter	3,665	18,066	18,420	6,367	7,279	53,922	2,499
3rd quarter	3,211	17,665	18,168	6,417	6,903	52,480	2,212
4th quarter	4,263	20,496	21,423	7,927	8,341	62,596	1,887
TOTAL	15,185	76,161	78,859	28,514	30,441	229,692	7,936
5-yr Av 1968-72	12,830	68,266	69,376	23,779	26,759	201,464	3,411
5-yr Av 1963-67	7,955	52,386	49,379	14,902	18,744	143,625	625

[a]Includes Yukon and Northwest Territories.

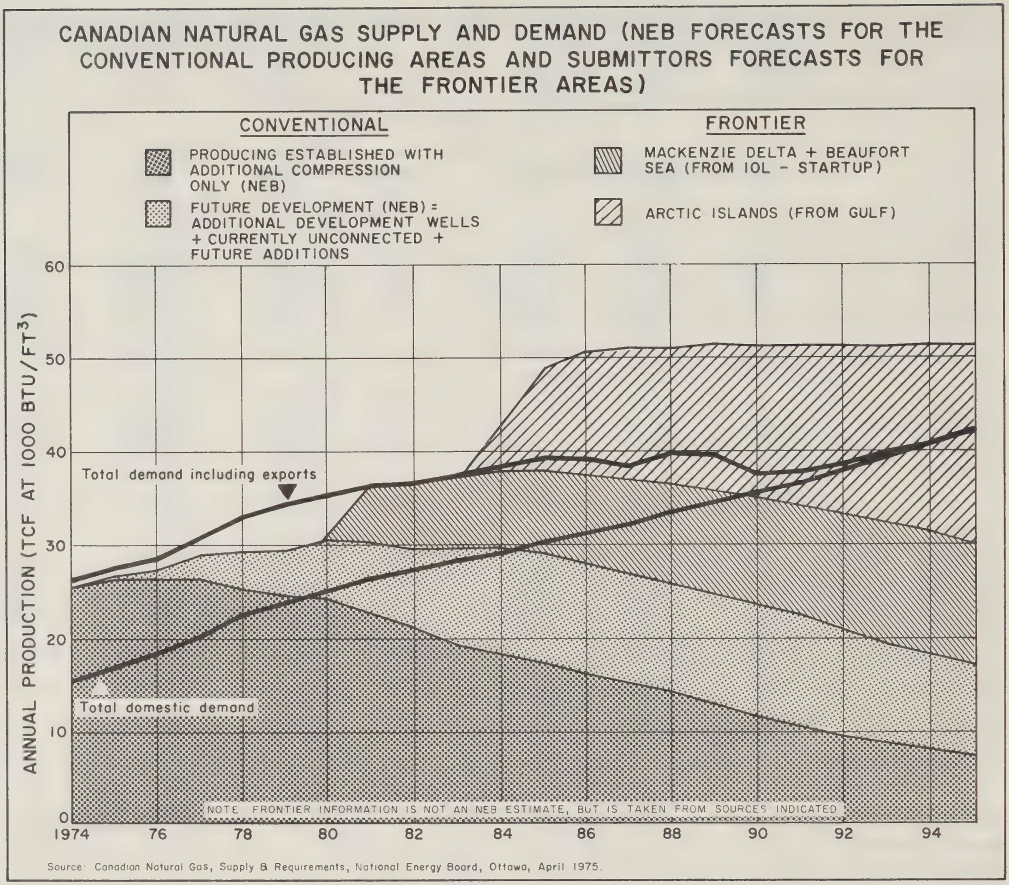
operation economically feasible. Furthermore, to reduce the risk in marketing gas to American users, the pipeline and distributing companies required delivery contracts. These contracts were made during times of low oil prices and natural gas was also competitively priced in U.S. natural gas markets. However, even though some price increases for natural gas have resulted from federal and provincial government actions and through negotiations with the U.S. Federal Power Commission, the contracted delivery rates remain virtually intact. Hence, Canadian gas exports to the United States will be a reality for several years.

Since 1972, exports to the United States have declined to 40 percent of marketable Canadian gas production. Despite the rapid growth in total demand, new discoveries more than matched annual production rates so that the proven reserves in the Western provinces increased from 35 trillion cubic feet in 1962 to almost 54 trillion at the end of 1971. But, since 1972, this situation has been reserved; remaining reserves in the Western provinces declined to nearly 51 trillion cubic feet by the end of 1973.

The N.E.B. grants export licences only when proven reserves exceed, by 25 times, the forecasted domestic market requirements four years hence. No major export licences have been granted since 1970. But large export contracts still exist and must be fulfilled. So long as no new export licences are issued, then as the existing contracts terminate, future exports to the United States will decline accordingly.

The situation and outlook for Canadian natural gas through to 1995 is shown in Figure 3. Most estimates on supply are limits imposed by deliverability factors such as existing and near-term pipeline and processing facilities. If the present natural gas use and production patterns are continued, then total domestic demand will exceed production from producing reserves by 1980 and production from future developments in conventional areas by 1984. However, projected production from all sources will satisfy both domestic and export demand by about 1981. Thus the projected shortfalls are confined to the remainder of the 1970s.

The main conclusions and recommendations of the N.E.B. report are summarized below:


CANADIAN NATURAL GAS SUPPLY AND DEMAND (NEB FORECASTS FOR THE CONVENTIONAL PRODUCING AREAS AND SUBMITTORS FORECASTS FOR THE FRONTIER AREAS)
CONVENTIONAL
PRODUCING ESTABLISHED WITH ADDITIONAL COMPRESSION ONLY (NEB)
FUTURE DEVELOPMENT (NEB) = ADDITIONAL DEVELOPMENT WELLS + CURRENTLY UNCONNECTED + FUTURE ADDITIONS
FRONTIER
MACKENZIE DELTA + BEAUFORT SEA (FROM IOL - STARTUP)
ARCTIC ISLANDS (FROM GULF)
Total demand including exports
Total domestic demand
ANNUAL PRODUCTION (TCF AT 1000 BTU/FT³)
0
10
20
30
40
50
60
1974
76
78
80
82
84
86
88
90
92
94
NOTE FRONTIER INFORMATION IS NOT AN NEB ESTIMATE, BUT IS TAKEN FROM SOURCES INDICATED
Source: Canadian Natural Gas, Supply & Requirements, National Energy Board, Ottawa, April 1975.
Figure 3

(A) Conclusions

- Canada's present shortfall in natural gas supplies is attributable to:
  - lack of deliverability resulting from low funding rates and lack of exploration incentive
  - a high growth in demand in domestic markets, partly caused by underpricing of natural gas relative to other energy sources.

- Improvements can be made by:
  - reducing domestic demand;
  - reducing existing export licences under recently-granted authority;
  - improving the deliverability of existing developed reserves.

  The latter appears most feasible with fewest undesirable effects on domestic and U.S. markets.

- Short-term improvements in deliverability will have to be restricted to already existing reserves, but a three-year lag occurs between initiation of development and the increase of gas on markets.

- Uncertainty about royalties and taxes still pervades producers' minds despite recent clarification by provincial governments; the producers' net-backs[1] are too low to stimulate new exploration and development investments.

- For Canada as a whole, full parity pricing of natural gas with competitive fuels (1) would not significantly improve the deliverability of natural gas to domestic markets; (2) it may encourage reserve development in the Western provinces and frontier areas; but (3) it would have an inflationary impact on the Canadian economy.

- If production from new reserves should come onto the market in excess of Canadian requirements, it should be priced in accordance with production and exploration costs; this would help improve Canada's competitive position in world markets.

- A previously unforeseen use for Canadian natural gas is as feedstock for the petro-chemical industry, especially the fertilizer industry and the Quebec market in steel production.

- The U.S. Federal Power Commission has recognized and accepted that Canadian gas and oil exports to the United States cannot be relied upon "at historic prices and levels of service". The potential for continuing exports to the United States lies in the mutual advantages which may accrue to both countries from new gas and oil transportation system developments so that U.S. North Slope Alaska reserves and Canadian High Arctic reserves could be developed.

(B) Recommendations

- The most important step in improving deliverability is to reduce uncertainty from producers' minds and assure a profitable net-back to stimulate exploration and development.

- Natural gas should be priced on an equivalent BTU basis with Canadian crude oil at Toronto within a three-year period.

- A two-price system for natural gas is recommended – one price for exports based on alternative energy prices and a lower price for domestic sales based on exploration and development costs.

- Cessation of all natural gas exports is not recommended since this would extend Canada's self-sufficiency only marginally.

- If Arctic reserves fail to materialize in significant quantities, the Government should require that exports to the United States be repaid in natural gas. (As of October 10, 1975, the N.E.B. was given authority to alter terms of any existing export licence upon approval of the Governor in Council).

On October 21, 1975 the Minister for Energy, Mines and Resources announced that an agreement, effective November 1, 1975 through June 30, 1976, had been signed by the governments of Canada and Alberta on the pricing and sales of Canadian natural gas. A plant-gate price of $.72 per thousand cubic feet of marketable natural gas was established for all Alberta gas. The domestic Toronto city-gate price will be increased to $1.25 per thousand, up from $ .80. The export price at the U.S. border will be increased to $1.60, up from $1.40 set in August 1975; before that the U.S. border price had been $1.00 since January 1975. After

[1] Net-backs are the producers' sales less payments for royalities, taxes, and transportation. They are comparable to a firm's revenues in an unregulated industry; they must pay production costs, investment costs and company profits from their net-backs.

deductions for transportation and quality, the excess revenues collected by the Alberta government will be rebated on all natural gas produced in the province, regardless of whether it is marketed for export or domestic use. The wellhead price is calculated by adjusting the plant-gate price for differences in transportation costs from the well to the processing plant and for differences in quality of wellhead gas.

ELECTRICITY SITUATION AND OUTLOOK

There has been little change since last year in the situation and outlook for Canadian electricity. Recently there have been some sizeable increases in electric power rates, as high as 25 and 30 percent for some customer classes. Last year it was reported that electrical utility companies were increasing the proportion of internal financing of new investment to take advantage of money market fluctuations. This is in part the case, but there are other advantages for them in financing a larger proportion of investment internally. By increasing their equity in new expansion, electric utilities also improve the investment ratings of their bonds and debentures on money markets. In general, highly-rated bonds and debentures also sell high in money markets. This in effect reduces the effective interest rate that electrical utilities must pay for their borrowed funds, thereby reducing the production costs of electrical power.

In the short run, higher electricity rates are unfavorable to users and consumers, but in the longer term if these higher rates are used to create internal capital to finance expanded service, there are substantive benefits in lower interest costs on borrowed capital funds. In general, electricity rate-setting boards in Canada have responded responsibly to requests for increased rates so that internal financing can occur now and so that future electricity shortfalls will not occur.

The outlook for Canadian electricity is quite favorable with no anticipated shortfalls so long as utilities continue to get adequate revenues to build for future expansion. Electricity rate increases probably will be about 10 percent a year for the next several years. However, in areas dependent upon thermal generations using fossil fuels, there may be short-term rate increases of up to 25 percent. Ontario has already approved a 25-percent rate increase effective January 1, 1976; but this is presently under legislative review.

IMPLICATIONS FOR CANADIAN AGRICULTURE

In 1974, Canadian farmers spent almost $500 million for fuels and electricity; 87 percent of these expenditures were for petroleum products. Table 10 contains data on farmers' expenditures for petroleum products.

From 1970 through 1973, Canadian farmers' fuel and petroleum expenditures were a declining proportion of their total expenditures. In 1974 the trend reversed with a significant increase occurring in Western Canada; the percentage rose from 10.6 percent in 1973 to 11.9 percent in 1974. While these changes in fuel expenditures may seem impressive when viewed by themselves and while they lessen farmers' incomes, they do not affect farm incomes as much as changes in commodity prices or crop yields. That is, there are far more serious changes confronting Canadian farmers each year than increasing fuel prices.

With respect to the Canadian fertilizer industry, its projected capacity through 1980 exceeds projected demand. Planned ammonia plants being constructed have already received long-term gas permits for needed feedstocks. Thus, projected natural gas shortfalls are not

TABLE 10. EXPENDITURES BY CANADIAN FARMERS ON PETROLEUM PRODUCTS[a], 1969 TO 1974

	East		West		Canada		Western Canada
Year	million $	% of total operating expenses	million $	% of total operating expenses	million $	% of total operating expenses	as Percent of Total %
1969	92.4	6.1	156.9	12.5	249.3	9.0	62.9
1970	97.5	6.3	158.9	12.6	256.4	9.1	62.0
1971	102.7	6.3	166.4	12.3	269.1	9.0	61.8
1972	106.5	6.1	175.9	12.0	282.4	8.8	62.3
1973	124.2	5.7	194.9	10.6	319.1	8.0	61.1
1974	156.9	6.0	279.6	11.9	436.5	8.8	64.1

[a]Includes petroleum, diesel oil, and lubricants.

Sources: Farm Net Income, Cat. No. 21-202, Annual, Statistics Canada.

expected to significantly influence the quantity or the prices of Canadian fertilizers sold domestically.

The Canadian greenhouse industry is a user of natural gas. About 80 percent of the industry is located in southern Ontario and 77 percent of this is heated by natural gas produced in Alberta. Most of these facilities were once fired with fuel oil burners that were retained as emergency heat sources; they can be switched from gas to fuel oil in a few hours. Thus, no major disruption in production is likely to occur during periods of shortfalls. There will no doubt be a reduction in incomes if greenhouses are heated with oil. This may become a serious problem for operators since they must compete with imported products from the United States and Mexico.

Petroleum and gas shortages or price increases will have little effect on returns in the food processing and distributing sectors and hence little effect on food prices. Fuel expenses form only a very small part of total operating expenses in these sectors.

The discussion in this section suggests that rising energy costs as a contributor to high operating costs and food prices is largely a myth. Non-fuel expenses are increasing faster and account for a greater share of operating expenses than do fuel costs.

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AGRICULTURAL LABOR

Agricultural employment increased by six thousand in 1974 and three thousand in 1975. The 1975 increase was due entirely to an increase in the number of paid farm workers whereas in the previous year all three labor components increased.

In 1976, the number of paid farm workers is expected to again increase while the number of unpaid family workers and farm operators is expected to decline.

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INTRODUCTION

One of the world's most universal trends has been the decreasing importance of the agricultural labor force relative to the total labor force. The trend exists in both industrialized and developing economies. In the developed countries there has been both a relative and an absolute decline in the agricultural labor force. However, in the developing countries the relative decline has occurred in spite of an increasing agricultural labor force. The extent of employment in agriculture, by continental area, is depicted in a recent FAO report. The two extremes are Africa, where 73 percent of the labor force is employed in agriculture, and North America where the figure is only 3 percent (Table 1).

In Canada, the steady decline in the agricultural labor force that has occurred since the 1940s came to a halt in 1974 when employment of each farm labor component (farm operators, unpaid family and paid workers) increased slightly[1]. Increased farm incomes and improved farm wages relative to non-farm wages, combined with government policies aimed at facilitating a greater supply of agricultural labor when needed, were key factors in the over-all change in the trend.

During the five-year period 1963-1967, the percentage increase in farm wages was greater than that for other agricultural input costs. However, due to the decrease in persons employed, the total cost of hired labor on farms remained relatively constant. A yearly average of 595 thousand persons worked on farms during this period of whom 100 thousand were paid workers, 127 thousand were unpaid family workers, and 397 thousand were farm operators (Table 2). For this period, employment was distributed by region as follows: Atlantic[2], 5.6 percent; Quebec, 19.3 percent; Ontario, 25.9 percent; Prairies, 45.4 percent, and British Columbia 3.7 percent (Table 3). Average hourly wages paid with, and without board (in brackets) in Canada were \$1.02 (1.19). Average monthly wages in Canada were \$161 (208) (Table 4).

During the five-year period 1968-1972 an average of 517 thousand workers were employed on farms, 13.1 percent below the level for the previous five-year period. Of these, 299 thousand or 57.8 percent were self-employed operators, 119 thousand or 23.0 percent were unpaid

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[1]Changes in employment from 1973 to 1974, both for Canada and the regions, fall within the bounds of statistical error present in the labor force survey and therefore may or may not represent actual changes.

[2]"Atlantic" Region includes N.B., N.S., P.E.I., Nfld.

TABLE 1. WORLD AGRICULTURAL LABOR FORCE

	Total agricultural labor force			Share of total labor force			Average annual increase	
	1960	1970	1975	1960	1970	1975	1960-70	1970-80
	— number in millions —			— percent —			— percent per year —	
Developed market economies[a]	55.6	43.1	37.0	20	14	11	−2.5	−3.1
North America	5.5	3.9	3.3	7	4	3	−3.2	−3.1
Western Europe	33.2	25.7	22.2	24	17	14	−2.5	−3.1
Oceania	.6	.6	.5	12	9	7	−.7	−1.4
Eastern Europe and U.S.S.R.	68.1	57.3	51.3	43	32	27	−1.7	−2.6
Total developed countries	123.7	100.4	88.3	28	21	17	−2.1	−2.8
Developing market economies[a]	375.6	421.1	444.9	71	65	61	1.1	1.1
Africa	73.6	83.8	39.4	81	76	73	1.3	1.3
Far East	236.4	265.4	280.2	74	68	64	1.2	1.1
Latin America	33.6	36.6	38.0	48	42	38	.9	.7
Near East	30.8	34.1	35.9	69	62	58	1.0	1.0
Asian centrally-planned economies	238.5	249.5	254.8	75	67	63	.5	.3
Total developing countries	614.1	670.6	699.8	73	66	62	.9	.8
World	737.8	771.1	788.1	58	51	48	.4	.4

[a]Including countries in other regions not specified.

Source: International Labor Office, Labor Force Projections, FAO Geneva, 1971.

TABLE 2. EMPLOYMENT IN CANADIAN AGRICULTURE BY CLASS OF WORKER, 1963-67 TO 1975

Year	Total	Paid workers		Unpaid family workers		Self-employed operators	
		— number in thousands[a] with percent of total in brackets —					
1963-67	595	100	(16.8)	127	(21.3)	367	(61.7)
1968-72	517	99	(19.2)	119	(23.0)	299	(57.8)
1973	467	96	(20.6)	100	(21.4)	270	(57.8)
1974	473	99	(20.9)	103	(21.8)	271	(57.3)
1975[b]	476	107	(22.5)	100	(21.0)	269	(56.5)
		average employment: January — September					
1974	482	103		104		275	
1975	487	113		103		272	

[a]Data may not total due to rounding.
[b]Unofficial estimate.

Source: Statistics Canada, Catalogue 71-001 monthly, Labor Force Survey.

family workers and 99 thousand or 19.2 percent were paid workers. Farm employment by region (with percentage of total in brackets) for this period was as follows: Atlantic Region 24 thousand (4.6 percent); Quebec 106 thousand (20.5 percent); Ontario 134 thousand (25.9 percent); Prairie Provinces 231 thousand (44.7 percent), and British Columbia 24 thousand (4.6 percent).

The decrease in farm employment between the two periods was due, in large part, to rapid farm mechanization, a declining rural population and the more attractive wages and working conditions in urban centres.

Labor Force Survey data indicate that the number of persons employed on farms increased from 467 thousand in 1973 to 473 thousand in 1974, an increase of 1.3 percent. Self-employed operators increased by one thousand while unpaid family workers and paid workers both increased by three thousand. On a regional basis, farm employment increased in the Atlantic and Prairie regions, decreased in Ontario and Quebec, and remained constant in British Columbia. In 1974, monthly farm wages in Canada increased by an average of 20.4 percent with board and 18.8 percent without board. Hourly farm wages increased by a similar amount. It is noteworthy that hourly farm wages without board were higher than the minimum wage in all provinces,

Quebec excepted, even though agriculture was exempt from minimum wage legislation.

SITUATION

Canada Manpower Assistance

The Manpower and Immigration Department provides employer and employee listing referrals, placement and training services through Canada Manpower Centres (CMC) and are closely associated with the Agriculture for Young Canadians (AYC) program as well as the Canadian Farm Labor Pool (CFLP) system.

The AYC program was started in 1974 to meet some of the special needs of the provinces by encouraging young workers to gain experience in agriculture while at the same time meeting some of the needs of farmers. The approach and size of the program vary from province to province. For example, in Alberta about 6,100 students were employed on farms, in Manitoba 400 students participated through the Student Temporary Employment Program (STEP) and in Ontario 200 students (1974) with no previous farm experience received training and employment.

Canada Farm Labor Pool Program

The Canada Farm Labor Pool Program (CFLP) was established in 1974 to better organize the agricultural labor market thereby providing greater stability in the supply of seasonal, relief and permanent farm workers. By December 1974, 35 CFLP's were operational with 3 in British Columbia, 6 in Alberta, 2 in Saskatchewan, 4 in Manitoba, 12 in Ontario, 3 in Quebec, 2 in Nova Scotia, 2 in New Brunswick, and one in Prince Edward Island placing a total of 16,826 workers. Newfoundland did not set up a pool since it had no shortage of farm workers. Nineteen new pools were established by July, 1975 and were distributed as follows: Alberta 3 Saskatchewan 4, Manitoba one, Ontario 3, Quebec 7, and Prince Edward Island one. From April 1 to July 31, 1975 the CFLP's received 35,311 requests for farm employees, of which 5,763 were cancelled for various reasons. The pools made 18,012 placements during this period and 11,338 vacancies remained unfilled on July 31. Vacancies by province were as follows: British Columbia 708; Alberta 594; Saskatchewan 418; Manitoba 898; Ontario 7,300; Quebec 842; Nova Scotia 67; New Brunswick 74 and Prince Edward Island 437 (Table 5).

Foreign Worker Programs

In addition to the above programs, the Department of Manpower and Immigration operates the Caribbean Seasonal Workers Program, the Mexican Seasonal Agricultural Workers Program, the United States-Canada Harvest Worker Exchange, and the International Student and Youth Exchange Programs.

In 1974, 5,342 Caribbeans entered Canada to work in agriculture, nearly double the 3,048 persons admitted in 1973. Except for 55 who went to Quebec, these workers were employed in Ontario harvesting fruit, vegetable and tobacco crops. By October, 1975 5,586 workers had been employed, from Jamaica (3,230 to Ontario, 71 to Quebec), Barbados (1,069 to Ontario) and Trinidad and

TABLE 3. EMPLOYMENT IN CANADIAN AGRICULTURE BY REGION, 1963-67 TO 1975

Year	Canada	Atlantic Region	Quebec	Ontario	Prairie	British Columbia
		— number in thousands[a] with percent of total in brackets —				
1963-67	595	33 (5.6)	115 (19.3)	154 (25.9)	270 (45.4)	22 (3.7)
1968-72	517	24 (4.6)	106 (20.5)	134 (25.9)	231 (44.7)	24 (4.6)
1973	467	20 (4.3)	88 (18.8)	122 (26.1)	216 (46.3)	21 (4.5)
1974	473	22 (4.7)	85 (18.0)	120 (25.4)	226 (47.8)	21 (4.4)
1975[b]	476	22 (4.6)	87 (18.3)	119 (25.0)	223 (46.9)	25 (5.3)
		average employment: January — September				
1974	482	22	86	124	229	21
1975	487	22	88	125	225	27

[a]Data may not total due to rounding.
[b]Unofficial estimate.

Source: Statistics Canada, Catalogue 71-001 monthly, Labor Force Survey.

TABLE 4. AVERAGE FARM WAGES IN CANADA OF MALE EMPLOYEES AS AT MAY 15, FOR 1963-67, 1968-72, 1974 AND 1975[a]

Province[b]	— With Board —						— Without Board —					
	1975		1974		1968-72	1963-67	1975		1974		1968-72	1963-67
	— dollars per hour —											
Canada	2.60	(26.2)	2.06	(19.8)	1.34	1.02	2.86	(22.8)	2.33	(17.1)	1.59	1.19
Maritimes	2.39	(34.3)	1.78	(17.9)	1.11	.86	2.46	(21.2)	2.03	(15.3)	1.29	.94
Quebec	2.31	(35.9)	1.70	(19.7)	1.14	.89	2.61	(24.3)	2.10	(18.0)	1.40	1.07
Ontario	2.57	(21.8)	2.11	(14.7)	1.43	1.04	2.84	(21.9)	2.33	(12.6)	1.68	1.21
Manitoba	2.51	(27.4)	1.97	(10.1)	1.30	1.00	2.75	(20.6)	2.28	(11.8)	1.54	1.18
Saskatchewan	2.67	(29.6)	2.06	(24.9)	1.33	1.07	3.05	(27.1)	2.40	(3.6)	1.56	1.26
Alberta	2.87	(31.7)	2.18	(25.3)	1.41	1.09	3.03	(19.8)	2.53	(27.1)	1.66	1.32
British Columbia	2.87	(16.7)	2.46	(20.0)	1.51	1.21	3.27	(26.7)	2.58	(10.3)	1.83	1.35
	— dollars per month —											
Canada	443	(15.7)	383	(20.4)	245	161	491	(10.8)	443	(18.8)	294	208
Maritimes	365	(14.1)	320	(22.6)	191	123	422	(9.6)	385	(24.2)	237	165
Quebec	358	(30.7)	274	(22.9)	183	134	472	(25.9)	375	(22.2)	238	177
Ontario	444	(10.5)	402	(12.3)	259	158	477	(7.0)	446	(12.6)	312	207
Manitoba	455	(26.7)	359	(18.1)	242	163	479	(15.1)	416	(13.7)	293	204
Saskatchewan	486	(20.3)	404	(27.0)	250	180	547	(19.4)	458	(24.1)	297	220
Alberta	473	(18.3)	400	(20.5)	256	176	529	(12.1)	472	(18.3)	304	223
British Columbia	503	(17.8)	427	(17.6)	288	180	543	(1.9)	533	(28.1)	338	253

[a]Data in brackets represent percentage change from previous year's average at May 15.
[b]Data for Newfoundland are not available.

Source: Statistics Canada, Catalogue 21-002 occasional.

Tobago (1,216 to Ontario). Quebec's limited participation is a result of the lack of workmen's compensation coverage required under the Caribbean Employment Agreement which is not available to agricultural workers in that province. Comparable insurance coverage satisfactory to the supplying countries is both difficult and expensive for Quebec farmers to obtain. A committee studying the problem has recommended that such coverage be available to farm workers which, if adopted, would increase Quebec's participation.

The Mexican program came into being late in 1974 with 195 workers being employed on Canadian farms. In 1975, the number of Mexican workers was 345 with

TABLE 5. CANADA FARM LABOR POOL SYSTEM, EMPLOYMENT OPERATIONS, APRIL 1 TO JULY 31, 1975[a]

	Employee orders	Vacancies cancelled	Placements	Unfilled vacancies
British Columbia	2,572	304	1,560	708
Alberta	3,841	324	2,923	594
Saskatchewan	943	159	366	418
Manitoba	2,854	503	1,453	898
Ontario	20,959	3,888	9,771	7,300
Quebec	1,862	237	783	842
New Brunswick	171	37	67	67
Nova Scotia	219	20	125	74
Prince Edward Island	1,692	291	964	437
Canada	35,113	5,763	18,012	11,338

[a]Many of the Farm Labor Pools did not become operative until late in 1975 and therefore the above data are not good indicators of potential activity.

Source: Canada Farm Labor Pool System, Report on Employment Operations.

employment by province as follows: Quebec, 8; Ontario, 252; Manitoba, 25, and Alberta, 60.

The number of workers involved in the United States-Canada Exchange varies considerably from year to year with American tobacco workers entering Ontario and Canadian potato workers going to Maine. Just over 300 Americans and a similar number of Canadians were exchanged in 1974.

Just under 2,000 young Europeans are temporarily employed on Canadian farms under annual exchange programs, with over half working in the tobacco harvest in Ontario.

Wages and Working Conditions

Low farm wages, long hours of work and inadequate housing, plus the lack of job security, vacation pay, workmen's compensation and other fringe benefits common to urban employment have, over time, discouraged many Canadians from remaining in or entering the agricultural industry. With farm labor shortages becoming more acute each year, farmers now recognize the need for improved working conditions to help attract labor. This need has been emphasized by the CFLP's and the Local Agricultural Manpower Boards (LAMB's) which are establishing guidelines for farm wage rates, working conditions and accomodation. In the past, very little labor legislation has applied to agriculture but it now appears that the provinces are giving greater consideration to the application of minimum wage laws to farm labor as well as the gradual application of other labor legislation to agriculture. For example, Ontario's Labor Standards have been recently revised to cover workers engaged in the harvesting of fruit, vegetables and tobacco; Newfoundland farm workers are protected under minimum wage legislation and several provinces are studying similar changes. The fact that Caribbean and Mexican workers must be paid the provincial minimum wage, or the going wage rate if it is higher, is further evidence that minimum wages for agriculture are being recognized.

In Table 6 data are presented by which provincial minimum wage levels can be compared with the average hourly farm wages for 1975. In all provinces the hourly farm wage rate was higher than the minimum wage with Saskatchewan, Alberta and British Columbia farmers paying over 50 cents an hour more than their provincial minimum wage. Although the wage rates used are averages for a wide range of skills and represent only those workers paid by the hour, the data suggest that the application of minimum wage laws would not impose a significant financial burden on agriculture in any province.

REGIONAL FARM LABOR SITUATION

British Columbia

An adequate supply of workers was available for seasonal work on the fruit crops in 1975 with the usual labor sources augmented by others available due to a heavy incidence of industrial strikes. Demand for harvest labor has been reduced through increased use of the 'U-Pick' method of harvesting which overcomes the farmer's problem of recruitment, supervision and trans-

TABLE 6. COMPARISON OF AVERAGE FARM WAGES AND MINIMUM WAGE LEVEL, 1975

Province[a]	Without board farm wages as at May 15, 1975	Provincial minimum wage level as of October, 1975	Amount greater than minimum wage
		– dollars per hour –	
Maritimes	2.46	2.28[b]	.18
Quebec	2.61	2.60	.01
Ontario	2.84	2.40	.44
Manitoba	2.75	2.30	.45
Saskatchewan	3.05	2.50	.55
Alberta	3.03	2.50	.53
British Columbia	3.27	2.50	.77

[a]Data for Newfoundland are not available but provincial minimum wage legislation covers agricultural workers.
[b]Average of Prince Edward Island ($2.30), Nova Scotia ($2.25) and New Brunswick (2.30) minimum wage levels.

Source: Farm wage rates: Statistics Canada, Catalogue 21-002 occasional. Provincial minimum wage levels: Labor Canada, Legislative Review.

portation of workers. Dairy farmers are being helped by the CFLP's which operate a province-wide relief milking service.

Prairie Provinces

In Alberta, the farm labor supply improved in 1975 to the point where some CFLP's were advertising for farmers to hire the available labor. In general, students met the need for seasonal labor although shortages still occurred when they returned to school. Farmers have expressed interest in hiring foreign workers who are able to remain on the farm until all harvesting is complete. The Prairie Provinces, especially Saskatchewan, are still experiencing a shortage of skilled workers capable of handling complicated and valuable machinery and livestock. The strong demand for workers trained in the field of agriculture requires increased enrollment in farm courses, but, due to the low over-all levels of unemployment in recent years, the number of persons applying for agricultural training has been small.

Ontario

The strong demand for seasonal labor from fruit, vegetable and tobacco growers created employment for 25 thousand Canadian workers and about 7 thousand foreign workers in 1975. As in the other regions, the most difficult problem faced by the CFLP's was the recruitment of workers with farm experience. Dairy farmers were especially short of labor in spite of an intensified training program and the establishment of a relief milking service. The Ontario Milk Marketing Board is currently developing employment standards applicable to workers on dairy farms in an attempt to attract more labor to that industry.

Quebec

The rapid mechanization of farming in Quebec has increased the demand for permanent, experienced farm labor. Skilled workers were still in short supply in 1975 but dramatic increases in farm wages combined with improvements in transportation and accomodation for farm employees are beginning to change the attitude of the labor force toward farm employment. Local workers provided almost all the seasonal labor with the absence of workmen's compensation coverage and language difficulties limiting the use of foreign workers.

Atlantic Region

The 'U-Pick' method of harvesting has been successful in solving the labor shortages in the strawberry industry in New Brunswick and Nova Scotia. In 1975, New Brunswick apple and potato growers were still short of labor although some potato growers purchased mechanical harvesters to alleviate the problem. Livestock producers in Nova Scotia are now hiring trained, but unexperienced workers, who acquire on-the-job experience. Increased recruitement activities and training programs enabled the CFLP's to supply sufficient farm labor in Prince Edward Island. That province is giving considerable attention to farm labor legislation with the objective of upgrading working conditions. In Newfoundland the situation was reversed with an oversupply of labor willing to do farm work. This is the combined result of a relatively small agricultural industry and a high rate of unemployment in the province, plus the fact that minimum wage laws apply to farm employment. At the present time Newfoundland is a possible source of seasonal labor for other provinces.

Unemployment

Provincial unemployment levels have an impact on the farm labor supply but, in most regions, the unemployed tend to be concentrated in urban centres and, in many cases, are recipients of welfare or unemployment insurance benefits. Therefore, they are not motivated to search for employment on farms and interest in such work is further decreased by the prevailing poor image of agricultural wages and working conditions. The average rate of unemployment for Canada in September, 1975 was 7.2 percent (seasonally adjusted). The seasonally-adjusted rates by province were: British Columbia, 9.6 percent; Alberta, 3.4 percent; Saskatchewan, 1.9 percent; Manitoba, 3.5 percent; Ontario, 5.8 percent; Quebec, 9.3 percent; New Brunswick, 10.4 percent; Nova Scotia, 8.1 percent, and Newfoundland, 18.8 percent. Similar data for Prince Edward Island were not available.

Situation in 1975

The current economic recession in Canada has not had a strong impact on the farm sector where expansion and development have been encouraged by favorable prices for most farm crops. The resulting rise in net farm incomes has created an increase in the demand for hired farm labor and has indirectly increased the supply through improved wage rates and working conditions. Considerable credit for the improved supply of farm labor must be given to the CMC's, CFLP's and LAMB's.

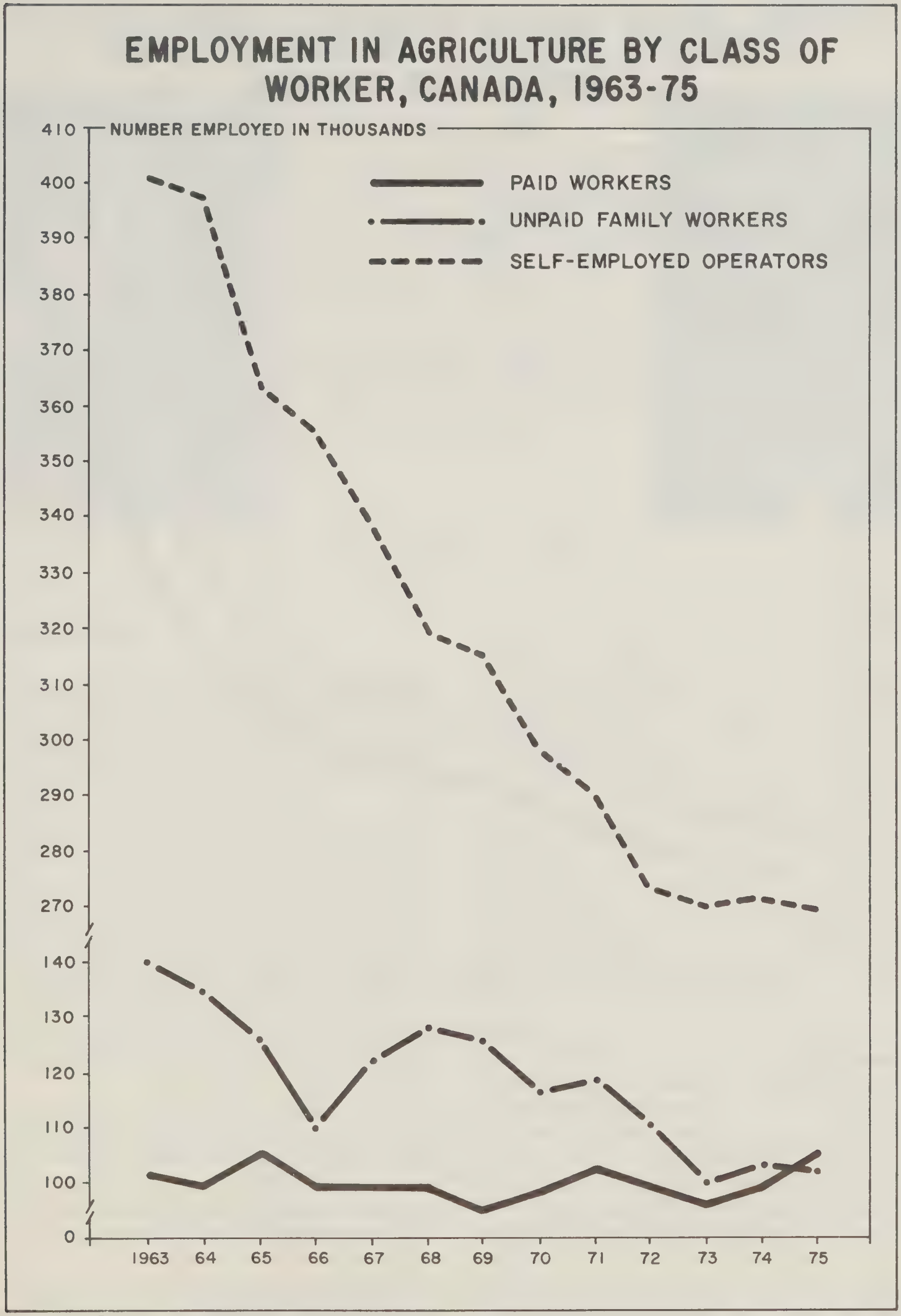
It appears certain that the total agricultural labor force was greater in 1975 than in 1974. Estimates, based on a comparison of the first nine months of 1974 and 1975,

placed total agricultural employment at 476 thousand, an increase of 3 thousand over last year. However, in contrast to 1974, when employment of all three farm labor components increased, only paid worker employment increased in 1975. The change in the average annual number of paid workers, in 1975, appeared to be entirely due to increased seasonal employment since there was an average decrease in employment of 2.3 thousand hired farm workers for the period January to April, and an average increase of 21 thousand for the period May to August compared with the respective period in 1974. Both farm operators and unpaid family workers declined in number in 1975, by about 2 thousand and 3 thousand, respectively (Table 2). Employment on farms is believed to have increased in Quebec and British Columbia, decreased in Ontario and the Prairie Provinces, and remained constant in the Atlantic region. Consequently, total farm employment estimates, by region, are as follows: British Columbia, 25 thousand; Prairie Provinces, 223 thousand; Ontario, 119 thousand; Quebec, 87 thousand; Atlantic Provinces, 22 thousand (Table 3). In the United States, a similar situation has developed according to the U.S.D.A. farm labor report for July, which indicated total farm employment was up 3 percent over last year, with average wages for the corresponding period up 16 cents an hour.

OUTLOOK

It is expected that the total Canadian farm labor force in 1976 will be somewhat greater than in 1975. Current net farm incomes, reasonably good prices for farm products partially ensured by the decision to exempt these prices from the new Incomes and Prices Guidelines, high unemployment rates discouraging movement from small farms while encouraging work on farms by non-farm labor and improved farm wages and working conditions all suggest that there will be a further increase in farm employment. Thus, the increase is expected to match the increase of 3 thousand in 1975 and may exceed this number by a considerable margin. Again, it will likely be the paid worker component that will increase total employment while family labor is expected to stabilize or decline slightly.

The present higher farm incomes have encouraged many farmers to remain in farming and at the same time made it possible for some farms to make a reasonable return after many years of extremely low incomes. Higher incomes have undoubtedly made it possible for many farm operators to hire extra labor, not only to expand or intensify production, but also to reduce the work load of the farm family. However, from 1977 to 1980, the farm labor force is expected to resume its traditional decline as farms become more mechanized, labor-saving techniques are adopted (i.e. 'U-Pick' harvesting) and small farms are consolidated. The particular year in which the downward trend resumes will depend on future net farm income levels and the time required to establish a reasonable growth rate in the economy together with a reduced rate of unemployment. When the trend does resume, the rate of decline should be less than the 2.7 percent annual decline experienced in the 1953-74 period. While an absolute decrease in the total farm labor force by 1980 appears inevitable, the data for 1974, 1975 and the outlook for 1976 suggest that the decline will be most evident in decreases in the number of farm operators and unpaid family labor with only a slight reduction in paid farm workers.


EMPLOYMENT IN AGRICULTURE BY CLASS OF WORKER, CANADA, 1963-75
NUMBER EMPLOYED IN THOUSANDS
PAID WORKERS
UNPAID FAMILY WORKERS
SELF-EMPLOYED OPERATORS
410
400
390
380
370
360
350
340
330
320
310
300
290
280
270
140
130
120
110
100
0
1963
64
65
66
67
68
69
70
71
72
73
74
75
Figure 1

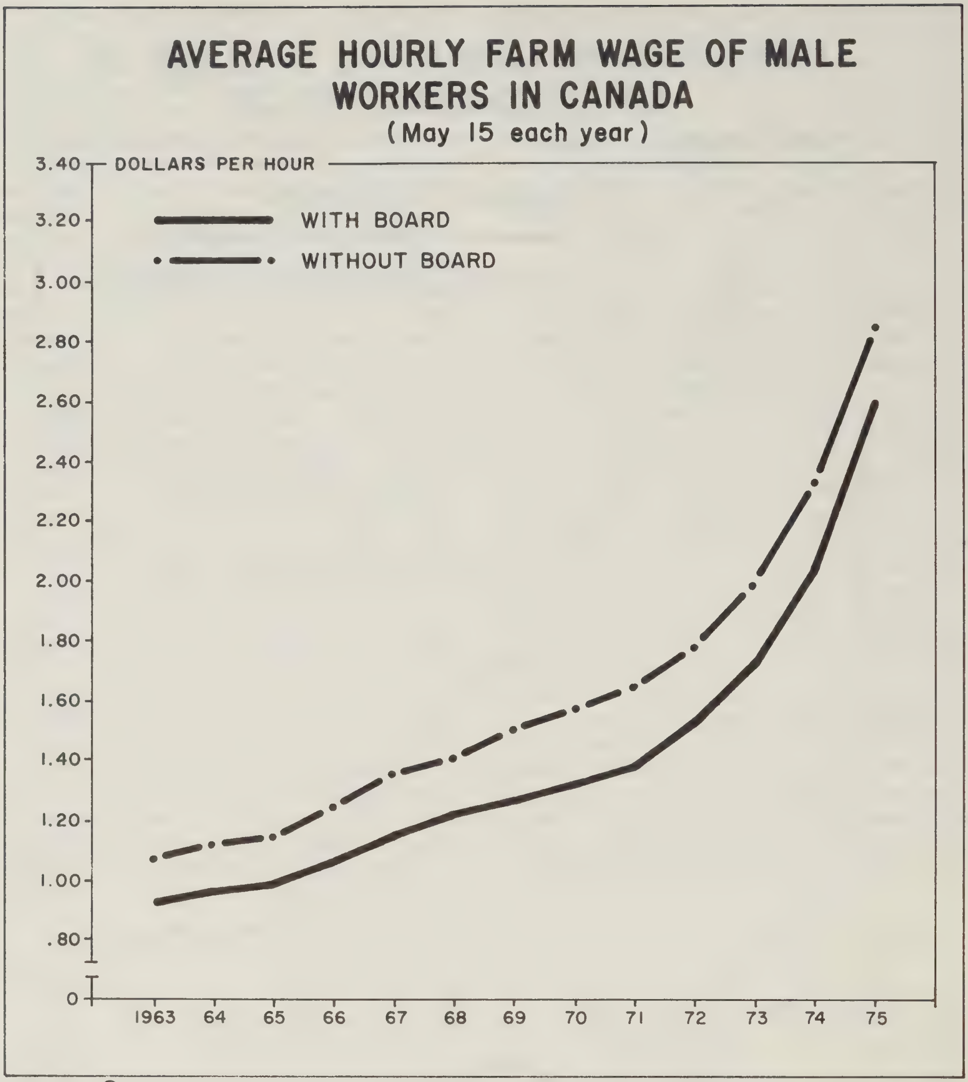

AVERAGE HOURLY FARM WAGE OF MALE WORKERS IN CANADA
(May 15 each year)
DOLLARS PER HOUR
3.40
3.20
3.00
2.80
2.60
2.40
2.20
2.00
1.80
1.60
1.40
1.20
1.00
.80
0
WITH BOARD
WITHOUT BOARD
1963
64
65
66
67
68
69
70
71
72
73
74
75

Figure 2

AGRICULTURAL CHEMICALS AND OTHER SUPPLIES

The supply of agricultural chemicals in 1976 should be sufficient to meet demand. Farmers should not encounter the delays and uncertainties of supply that existed in 1975. Prices should be close to 1975 levels.

Baler twine will be in adequate supply with spring prices at $18 to $20 a bale. Antifreeze supplies will be adequate with prices showing little change from 1975.

*D.M. Shute and V.A. Heighton**

INTRODUCTION

Chemicals are essential for agricultural production today despite cries from environmentalists. Commercial production of many fruits and vegetables would be almost impossible without their use and substantial losses would occur in some field crops due to insect and fungus damage. Their absence would necessitate large increases in the labor, machinery and fuel required for weed control. As Canada depends largely on imports, totalling $80 million in 1974, for raw materials used in the formulation of agricultural chemicals, our needs are greatly affected by world supply and demand. Canada also has an interest in pesticide exports, exporting about $7 million of insecticides and rodenticides in 1974, 24 percent more than in 1973. Sixty percent of these exports went to the United States in 1974 compared with 64 percent in 1973.

Despite their technical importance, agricultural chemicals comprised only 1.4 percent of total farm inputs in 1974 (Table 1). Pesticide usage, however, exceeded the record level of 1973 by 10 percent, and increased at the annual rate of 7.1 percent from 1963 to 1974. Although pesticide expenditures in current dollars increased in every province or region in Canada in 1974, expenditures in constant 1961 dollars decreased everywhere but in the Prairie Provinces. For example, 1974 pesticide expenditures in current dollars increased in Manitoba, Saskatchewan and Alberta from 1973 by 41, 56 and 50 percent, respectively. Expenditures in constant 1961 dollars, however, increased 8, 19 and 14 percent, respectively. In the Maritimes, Ontario, Quebec and British Columbia, pesticide expenditures in current dollars increased 13, 9, 17 and 26 percent, respectively, while expenditures in constant 1961 dollars decreased 14, 16, 10 and 4 percent. These figures give some indication of the amount of the increased expenditures in current dollars due to increased agricultural chemical prices and that due to increased use.

World

The world supply situation for agricultural chemicals was extremely tight throughout 1974 and into 1975 with demand exceeding worldwide capacity by 10 to 30 percent for some individual products[1]. Prices for some products rose by up to four times from 1973. The supply situation eased somewhat during the latter part of 1975 because of lower demand resulting from lower com-

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[1] United Nations, Food and Agricultural Organization Mid-Term Review, August 1975.

TABLE 1. INDEXES OF PESTICIDE USAGE, CANADA 1963-1974, (1961=100)[a]

	BRITISH COLUMBIA		PRAIRIES		ONTARIO		QUEBEC		MARITIMES		CANADA	
		% of total Inputs		% of total Inputs		% of total Inputs		% of total Inputs		% of total Inputs		% of total Inputs
1963	110	1.0	99	.6	151	.8	130	.4	118	1.1	117	.7
1964	105	.9	97	.6	177	.9	137	.5	118	1.1	123	.7
1965	102	.8	102	.6	199	1.0	162	.6	120	1.1	132	.8
1966	134	1.0	140	.7	258	1.3	189	.6	156	1.4	175	1.0
1967	150	1.1	155	.9	290	1.4	213	.9	175	1.7	195	1.1
1968	175	1.2	182	1.1	336	1.6	246	.8	204	2.0	228	1.2
1969	154	1.0	147	.9	311	1.5	235	.8	187	1.8	200	1.1
1970	137	.8	117	.7	292	1.4	228	.8	174	1.7	177	1.0
1971	135	1.0	116	.7	288	1.4	229	.8	172	1.7	175	.9
1972	167	1.0	143	.8	356	1.7	278	.9	212	2.2	216	1.1
1973	242	1.4	207	1.2	468	2.2	374	1.2	278	2.6	288	1.3
1974	232	1.3	237	1.2	391	1.8	336	1.1	278	2.6	288	1.4
GROWTH RATES[b] 1963-1974	6.8		6.0		8.7		8.9		8.3		7.1	

[a]The data are based on 1961 dollars to remove the effect of price changes and give an indication of the actual increase or decrease in pesticide usage.

[b]All growth rates over the period 1963 to 1974 were calculated by fitting an exponential trend line to the data using the least squares method and then using the compound interest formula.

Source: Based on Statistics Canada data.

modity prices and price resistance rather than because of any significant increases in supply. The current shortage is largely attributable to lagging production capacity.

Substantial increases in demand for agricultural chemicals in the 1970s have exceeded the projected utilization growth rates, especially in developing countries. Shortages of petroleum and phosphate feedstocks, and restrictive legislation applying to the manufacture and sale of certain products such as aldrin, dieldrin and DDT, have helped to curtail output. Developing countries, which are almost totally dependent on imports, are more seriously affected by world shortages. Many of these countries have been unable to meet their requirements not only because of supply shortages, but also lack of foreign exchange.

United States

Demand for pesticides in the United States increased about 15 percent in 1974 over 1973 as a result of strong crop prices and increased crop acreage. In addition, foreign demand for pesticides manufactured in the United States increased. Increased demand and limited production resulted in drastically reduced inventories in 1974. Despite these problems, pesticide supplies in 1974 were only slightly short of aggregate demand. Some distribution difficulties were experienced. Although pesticide producers reported output to be only 10 percent short of their production goals in 1974, distributors indicated that they were about 25 percent short of meeting customer requests[2].

A 25-percent price rise in 1974 over year-earlier levels for basic pesticide products and about a 12-percent rise for formulated products at the wholesale level resulted from the tight supply situation. Pesticide demand in 1975 was expected to be about the same as in 1974, but since pesticide production problems were not as severe, supplies appeared to be about adequate for the year's demand. Prices for basic products in 1975 were reported to be up 25 percent and wholesale prices for formulated products rose about 20 percent over 1974 levels.

Canada

Pesticide expenditures in terms of 1961 dollars in 1974 were up 10 percent from 1973 for many of the same

[2]U.S.D.A. E.R.S., Agricultural Economic Report No. 300, "Evaluation of Pesticide Supplies and Demand for 1974, 1975 and 1976". July 1975.

reasons as in the United States, such as strong crop prices and the higher cost of labor, machinery and fuel. Value of sales of pest control products was up 41 percent from 1973 (Table 2). Although some shortages for agricultural chemicals were experienced in 1974 and 1975, demand was basically met or substitutes provided. Higher prices were associated with the tight supply situation, both for basic products and formulations. The quantity of imports of agricultural chemicals for the first eight months of 1975 was up about 7 percent from the same period in 1974. Value of imports for the first eight months in 1975 was up 46 percent from 1974 (Table 3).

TABLE 2. VALUE OF SALES OF PEST CONTROL PRODUCTS, CANADA, 1963-1974 (YEARS ENDING SEPT. 30)

Year	Total[a]	Herbicides[b]	Crops & Seed Treatments	Livestock Treatments[c]
		— thousand dollars —		
1963	28576	12673	13400	2503
1964	27216	14561	10285	2370
1965	29928	17194	10093	2641
1966	40228	23054	11695	5479
1967	45581	32136	8769	4676
1968	53841	34672	12394	6775
1969	46138	27524	13102	5512
1970	39946	21286	12642	6018
1971	41137	25805	13062	2270[c]
1972	51853	34796	14711	2346[c]
1973	75996	53330	20065	2601[c]
1974	107348	79792	24667	2889[c]

[a]Excludes rodenticides and household and industrial insecticides.
[b]From 1949 to 1957 this category was called weedicides.
[c]Includes only livestock insecticides.

Source: Statistics Canada, Sales of Pest Control Products by Canadian Registrants, Cat. No. 46-212, Annual.

OUTLOOK

World

Some pesticide shortages were experienced in 1975 and are a continuing threat until major new production capacity becomes available. The longer-term problem is for an assured supply of lower-priced commodity-type products that developing countries can afford. The high technology required in pesticide manufacture currently limits almost all pesticide manufacture to the industrialized countries. Legal restrictions in producing countries apply almost exclusively to worldwide-use chemicals such as aldrin, dieldrin, and DDT which form more than half of the developing country use. FAO has estimated crop losses in developing countries due to pests at 50 percent or more[3]. The pesticide shortage can be expected to have serious damaging effects on harvests in these countries in 1976.

TABLE 3. IMPORTS INTO CANADA OF AGRICULTURAL CHEMICALS BY VALUE AND QUANTITY

	Value	Quantity
	$000	000 lbs.
1968	35,740	102,404
1969	38,772	93,947
1970	23,047	62,143
1971	30,221	71,495
1972	38,588	88,959
1973	53,828	125,743
1974	79,664	157,532
1974		
(first 8 mos.)	56,121	110,254
% total for year	45.9	70.0
1975		
(first 8 mos.)	81,877	117,884
1975 year[a]	116,303	168,406

[a]Assuming same proportion of total, imported in first 8 months of 75 as in 74, as conditions were similar in both years (i.e. a tight supply situation).

Source: Statistics Canada, Trade of Canada, Imports, Cat. No. 65-007.

United States

Substantial expansion of production capacity of pesticides is currently planned or underway. This expansion increased supplies only slightly in 1975, but should substantially increase supplies in 1976. In addition, the availability of raw materials should continue to improve so that supplies of most pesticides should be adequate or nearly adequate in 1976. Farmers and distributors should be able to obtain supplies of pesticides without most of the delays and allocation procedures experienced in recent years. The predicted improvement in available supplies should have a softening effect on price in 1976. However, the problem of energy availability probably will continue and will most likely have some effect on raw material prices[4].

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[3]United Nations, Report of World Food Conference, 1975.

[4]U.S.D.A., E.R.S., Agricultural Economics Report No. 300, "Evaluation of Pesticide Supplies and Demand for 1974, 1975 and 1976".

Canada

Canada's outlook for pesticides is closely tied to that for the United States as over 80 percent of the agricultural chemicals imported in 1974 were from that country (Table 4), equalling about 55 percent of total sales of pesticides in Canada. The effects of new production capacity in the United States should come on stream in 1976 resulting in increased supplies. Although the supply situation will not be excessive in 1976, it should be adequate. Further price increases in 1976 are not expected, but should they occur, they will not be of the magnitude of the increases in 1974 and 1975.

TABLE 4. CANADIAN IMPORTS OF AGRICULTURAL CHEMICALS BY COUNTRY OF ORIGIN AS A PERCENTAGE OF TOTAL YEAR'S IMPORTS OF CHEMICALS

	1973		1974	
	Value	Quantity	Value	Quantity
	%	%	%	%
United States	76.1	80.0	73.9	81.9
United Kingdom	6.6	4.5	7.3	4.1
Switzerland	7.1	2.4	4.0	1.5
West Germany	3.1	4.5	3.2	4.2
Netherlands	3.9	3.7	8.1	4.9
Belgium-Luxembourg	0.4	1.9	0.6	1.7
Denmark	0.7	0.7	1.2	0.7
France	0.8	1.4	0.8	0.4
Japan	0.7	0.2	0.2	0.3
Yugoslavia	0.0	–	0.08	0.03
Others	0.6	0.7	0.6	0.3
Total	100	100	100	100

The Canadian Agricultural Chemicals Association (C.A.C.A.) at its 1975 annual meeting called for a reduction in foreign tariffs on pest control chemicals and, failing this, suggested that additional measures be introduced to encourage investment in the Canadian industry by compensating non-tariff incentives for capital investment. The C.A.C.A. argued that under present tariff conditions there is no incentive for plant expansion or establishment of new plants in Canada, while there is every incentive for such expansion or new establishment in the United States. It concluded that the Canadian industry would not grow and might not even survive if the appropriate incentives were not provided.

Canada's Minister of Agriculture, speaking to the C.A.C.A. annual meeting, indicated his support for a GATT revision of the tariff barriers affecting exports of agricultural chemicals from Canada.

The C.A.C.A. is also concerned about the direct imports of agricultural chemicals by individual farmers for their own use. There is concern about the possibility of farmers importing harmful chemicals, but it must be noted that farmers are subject to the same restrictions on imports as registered distributors. The C.A.C.A. argued that the trade in these direct imports was growing and having an adverse economic effect on Canadian suppliers. However, these imports at present form a relatively small part of the total and were estimated by C.A.C.A. at about $1 million in 1974, compared to a total import value of $80 million and total consumption in agriculture of $108 million.

OTHER SUPPLIES

Baler Twine

World Situation – Drought in parts of Africa and depressed prices led to reduced supplies of sisal and henequen fibers in the early 1970s. Production estimates for these fibers indicate more than a 3-percent increase in 1974 over 1973. Little change is expected in production in 1975. Fiber supplies may increase slightly in 1976 as a result of increased plantings in early years. The average price of sisal in 1974 was about two and one-half times the 1973 price. During the latter part of 1975, however, prices declined more than 30 percent from 1974 levels.

United States – Approximately 80 percent of the baler twine supply is imported. Imports of twine from October 1974 to March 1975 were up 19 percent from the same period a year ago and 50 percent above the 1972-73 period.

Production of synthetic twine is expanding rapidly. Production of polypropylene twine totalled 15 million pounds in 1973 and 30 million pounds in 1974, and is expected to be about 70 million pounds in 1975. Future expansion in the production of synthetic twine could be curtailed by lower natural fiber prices and by improvement in economic conditions because synthetics have other uses in addition to baler twine.

Retail prices of baler twine fell during the latter part of 1975. Prices in 1974 and in April 1975 ranged from about $30 to $35 a 40-pound bale. Synthetic twine was selling for $2 and $3 less. By the middle of 1975 the price of twine had fallen by at least $10 a bale.

Canada – The current baler twine situation is one of generally more than adequate supply. Sisal and synthetic fibers have alternate uses in carpets, mats, furniture

coverings, etc. A slowdown in housing starts in 1975 has made more fiber available for twine manufacture. There was a lot of stockpiling done on farms in 1974 because of rising prices and this resulted in lower purchases of twine by farmers in 1975.

About 90 percent of the baler twine used in Canada is imported, the balance being of synthetic manufacture. Imports come mainly from Mexico, Brazil, Tanzania and the United States. Imports of baler twine by Canada for the first eight months of 1975 were down about 10 percent from the same period of 1974. Imports for the year 1974 were about 112 million pounds, compared with 87 million pounds in 1973. It appears that adequate supplies will be available for 1976. Data on imports are shown in tables 5 and 6.

TABLE 5. CANADA: IMPORTS OF BALER TWINE, 1968-1974

Year	Quantity	Value*	Unit Value
	pounds	dollars	
1968	45,974,852	5,407,064	11.76
1969	37,524,010	4,215,965	11.23
1970	46,999,388	5,201,113	11.07
1971	80,360,377	8,372,713	10.41
1972	88,419,440	10,159,941	11.49
1973	86,989,729	13,365,662	15.36
1974	112,902,327	49,628,238	43.96
1974 (1st 8 months)	81,525,190	32,936,753	40.40
1975 (1st 8 months)	72,927,123	40,573,000	55.60

*Value of f.o.b.

Source: Statistics Canada, Trade of Canada, Imports, Cat. No. 65-007.

Twine prices in Canada rose rapidly in 1974 and these high prices continued into the early part of 1975. In the spring of 1973 a bale of twine (40 pounds gross weight) retailed at about $7. During the summer of 1973 the price rose to about $9 a bale and then to about $28 in the summer of 1974. It was over $30 by the fall of 1974. The price in the spring of 1975 was about $35 but by late summer it had fallen about $10 a bale to a range from $19 to $25. Retail prices can be expected to fall further by the spring of 1976 to about $18 to $20 a bale.

Antifreeze

Supplies of antifreeze are now adequate. Shortages, which first began to appear early in the fall in 1973,

TABLE 6. CANADA: IMPORTS OF BALER TWINE BY COUNTRY OF ORIGIN, 1968 AND 1974

Country	1968	1974
	— percent —	
United Kingdom	1.9	3.5
Belgium-Luxembourg	1.8	5.6
Denmark	6.3	0.4
Portugal	28.6	0.5
Tanzania	18.6	14.6
Brazil	3.0	20.7
Haiti	—	7.0
Mexico	19.2	19.6
United States	2.9	16.1
Other*	17.7	12.0
Total	100.0	100.0

*Mainly Ireland, Kenya, and Mozambique.

Source: Statistics Canada, Trade of Canada, Imports, Cat. No. 65-007.

were seen to dissipate in the spring of 1975. Panic buying and hoarding helped to worsen the situation in 1974. The main reason for the increase in the availability of antifreeze is that more ethylene glycol-based product is available. This situation is due to decreased demand for ethlyene glycol by auto manufacturers; demand is also down for polyster fibers, another ethylene-based product.

The Canadian market for antifreeze absorbs an estimated 14 million gallons a year. Dow Chemical of Canada Limited, Sarina, Ontario, and Union Carbide of Canada Limited, Toronto, supply this requirement.

Ethylene glycol antifreeze was generally retailing in the range of $2.50 to $3.00 per gallon in 1973, $6.75 to $9.00 per gallon in 1974 and $6.00 to $7.00 per gallon in 1975.

The outlook for antifreeze in 1976 is that supplies will be adequate. Prices are not expected to change significantly.

SUMMARY

Agricultural chemical supplies in 1976, as a result of increased production capacity in the United States and improved availability of raw materials, should be adequate or nearly so for farmers in the United States and Canada. This will enable farmers to obtain supplies without many of the delays and uncertainties of supply experienced in 1974 and 1975.

The effect of improved supplies in 1975 on prices has been tempered to some extent by the depletion of inventories in 1974. Shortages played havoc with carry-over stocks in 1973 and 1974. In 1975 most pesticide inventories were beginning to be rebuilt, which should have a positive supply and price effect in 1976.

Whether the apparent decrease in usage in all areas of Canada in 1974 except the Prairies was a result of decreased availability or buyer resistance to increased prices, should come to light as the supply situation eases and prices remain about the same. The world outlook for agricultural chemicals, however, is not so optimistic. Developing countries need not only to be assured of an adequate supply, but of an adequate supply of lower-priced commodity-type products that they can afford. Legal restrictions in producing countries apply almost exclusively to worldwide-use chemicals which form more than half of developing country use.

There will be an adequate supply of baler twine in Canada in 1976 with retail prices in the spring expected to be $18 to $20 a bale.

Antifreeze will be in adequate supply with prices showing little change from 1975.

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ACKNOWLEDGEMENT

The assistance of Mr. W. Ormrod, Plant Products Division, Production and Marketing Branch, Agriculture Canada, is greatly appreciated by the authors.

POLICY AND PROGRAM DEVELOPMENTS

ANIMAL CONTAGIOUS DISEASES ACT

Bluetongue Amendment

Authorized the change in health requirements for cattle imported from the United States, as announced by Agriculture Canada October 14. Cattle entering from that country must now be given two tests for bluetongue instead of the former one. The second test must be conducted not less than 30 days and not more than 90 days after the first and within 30 days of shipment to Canada. This regulation, intended to keep Canadian herds free from bluetongue, applies to feeder cattle and breeding stock. Cattle imported from the United States for immediate slaughter are exempt.

Imported U.S. cattle must also be tested for anaplasmosis, tuberculosis and brucellosis. There are strict regulations concerning testing of herds of origin for these diseases. The regulations became effective October 27, 1975.

FARM PRODUCTS MARKETING AGENCIES ACT

CEMA Amendment

Since the Canadian Egg Marketing Agency (CEMA) was established in 1972 certain operational changes have been required, and some of these demanded legislation under the act. Two such changes were authorized by this amendment, which was effective September 21, 1975.

Three provinces, Prince Edward Island, Nova Scotia and New Brunswick, each of which produces less than two percent of the egg market, became eligible for exemption from a 10-percent cutback in production decided on in January 1975 by all parties to the CEMA agreement. The amendment also authorized an increase in Agency members from 10 to 12.

POLICIES AND PROGRAMS

Grains

Cash advances to eastern grain farmers equal to those given to western farmers were announced by the Minister of Agriculture, Mr. Whelan, October 27. Advances are deducted from future sales, and each farmer is eligible for up to $7,500. This would offer eastern producers the same opportunities as those in the West, where the Prairie Grain Advance Payments Act has helped to stabilize conditions.

On October 10 the Minister responsible for the Canadian Wheat Board, Mr. Lang, announced increases in initial prices for basic grades of wheat, barley and oats for the 1975-76 crop year. The higher initial prices reflect the strong world demand for wheat, though for barley and oats the increase is not so high because of lower demand for feed grains. On the same date the Wheat Board announced increased initial prices for the remaining grades of grain. These announcements came the day after the Wheat Board disclosed that Canada had sold 500,000 long tons of wheat to the Soviet Union.

A new winter wheat variety, Lennox, has been licensed for the Maritime region. It is higher yielding than Yorkstar, Genesee and Talbot, and is restricted to use as livestock feed.

Cattle and Dairy Products

A new beef stabilization program, effective from August to December, 1975, replaced the previous August-to-August program. Under it the federal government paid farmers the difference between a support price of $43.94 a hundredweight and the national average weighted price received for Al and A2 cattle, if the average price is below support level. The deficiency payment was made on A, B, and C cattle sold for slaughter. The next slaughter cattle support program will apply to the calendar year 1976.

The deadline for requesting permits for importing European cattle during 1976-77 was November 30, 1975, with allowances made for postal difficulties. Agriculture Canada is prepared to accept applications for cattle from Austria, Denmark, France, Holland, Italy, Switzerland and West Germany.

Effective October 1, 1975, the Canadian Dairy Commission announced an export stabilization fund for dairy products at a levy rate of 65 cents a hundred pounds of milk. This was a reduction of 25 cents from the previous level. A refund was given to producers on deliveries made between July 1 and September 30 amounting to 25 cents a hundred pounds of milk on in-quota deliveries to which the former 90-cent rate applied.

The commission also announced November 4 that the support price on manufacturing milk would be reduced to cover 75 percent of deliveries under quota during the 1975-76 dairy year.

Fruit, Vegetables, etc.

The Agricultural Products Board agreed to buy up surplus processing apples in Nova Scotia and New Brunswick under a special program to encourage growers to harvest this year's bumper crop.

A grant of $85,194 under the New Crop Development Fund has been committed over the next three years to expand grape-growing areas in Essex and Norfolk counties in Ontario. The money will be used by the provincial Wine Council and Grape Producers Marketing Board to determine possible new production sites for vinifera grapes, from which European-type wines are made.

In October representatives of tobacco growers from Ontario, Quebec, Nova Scotia and Prince Edward Island set up a committee to consider proposals for a national tobacco marketing plan. The committee met in Ottawa on October 30.

PUBLICATIONS

ECONOMICS BRANCH

Available from Publications Manager, Room 303, Sir John Carling Building, Ottawa, K1A 0C7.

Beef Cattle and Hog Outlook. October 1975. Tables. 27 p. Includes outlook summaries for both beef and hogs. Also forecasts hog marketings for period Dec. 28, 1975 – June end, 1976. Appendix – Agricultural Stabilization Act.

AGRICULTURE CANADA

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